FIVE-YEAR REVIEW REPORT

Third Five-Year Review Report
For
Burlington Northern Tie Plant Contamination Superfund Site
Brainerd/Baxter
Crow Wing County, Minnesota

PREPARED BY
Minnesota Pollution Control Agency
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Approved by: **Date:**

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Sept. 30, 2003

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9/30/03

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List of Acronyms

BNSF	Burlington Northern and Santa Fe Railway Company
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cPAH	Carcinogenic Polynuclear Aromatic Hydrocarbons
DNR	Minnesota Department of Natural Resources
DRO	Diesel Range Organics
EDD	Enforcement Decision Document
USEPA	United States Environmental Protection Agency
FS	Feasibility Study
GRO	Gasoline Range Organics
HBV	Health Based Value
HDPE	High density polyethylene
IRIS	Integrated Risk Information System
MDH	Minnesota Department of Health
mg/kg	Milligrams per Kilogram
MN	Minnesota
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	Monitoring Well
NCP	National Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polynuclear Armomatic Hydrocarbons
PRPs	Potentially Responsible Parties
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act of 1976
RETEC	The RETEC Group, Inc.
RI	Remedial Investigation
ROD	Record of Decision
RP	Responsible Party
SESOIL	Seasonal Soil Compartment Model
the Site	Burlington Northern Tie Plant Superfund Site
SSL	US EPA Soil Screening Levels
SLV	Soil Leaching Numbers
SPM	State Project Manager
SRV	Soil Reference Value
STW	Short Term Worker
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TBC	To Be Considered
ug/L	Micrograms per Liter

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Executive Summary

The Burlington Northern Tie Plant Superfund Site (the Site) is a source area for which, section 121 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires that periodic (at least once every five years) reviews be conducted for sites where hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure following the completion of all remedial actions for the site. Contaminants in two waste lagoons, the Resource Conservation and Recovery Act of 1976 (RCRA) impoundment and the old CERCLA lagoon, resulted from past disposal of creosote mixtures. The primary constituents of concern are Polynuclear Aromatic Hydrocarbons (PAH) compounds, heterocyclic, phenols, and Diesel Range Organics (DRO). Metals and Gasoline Range Organics (GRO) were found as well. These constituents are present in the sludge and visibly contaminated soils in the closed hazardous waste landfill, and other soils above and below the water table, and in the ground water.

All of the wastewater and liquid creosote were removed from the RCRA lagoon between 1982 and 1985. Visibly contaminated soils and sludges that were above the ground water table were excavated from the lagoon bottoms and other sources areas, including the Process Area, the Black Dock, the Drip Track, the Conveyance Trench, and other piping locations. Upon excavation, the soils and sludges were stockpiled, and gradually placed into a land treatment unit with a 100 millimeter bottom liner and leachate collection system for biological treatment. The land treatment unit was located directly over the former RCRA lagoon. In 1994, the soils and sludges had not decomposed to acceptable levels required for closure. It was decided to cap the sludge and contaminated soils and a RCRA cap was placed on the land treatment unit in 1995. No confirmation soil samples were collected after the sludges and visibly contaminated soils were excavated from above the water table at any location on the Site.

Based on the Enforcement Decision Document (EDD), ground water contamination would be contained and cleaned up by pumping the three gradient control wells. In 1992, an air sparging system was installed to reduce naphthalene concentrations so that ground water would not have to be pumped to the sanitary sewer and, could instead, be discharged directly to the Mississippi River under a National Pollutant Discharge Elimination System (NPDES) permit. In December 2001, the three gradient control wells were shut off and only the air sparging system is currently operating. In September 2002, Minnesota Pollution Control Agency (MPCA) staff informed Burlington Northern and Santa Fe Railway Company (BNSF) that the plume appeared to be migrating in a different direction without treatment and its downgradient extent is unknown. In May 2003, the plume was found to be migrating eastward towards the Mississippi River without treatment. Whether or not it has migrated beyond the property boundary or is migrating as an unstable plume is being investigated through the RCRA program.

In February of 1991, the ground water and the closed hazardous waste landfill portions of the Site were transferred to the RCRA program. A RCRA permit MND000686196 was issued for the land treatment unit, storage pile, and the ground water monitoring and remediation in December 1986. The permit was re-issued twice, most recently in 2001 for permitting a closed hazardous waste landfill and for addressing cleanup, monitoring and reporting of the ground

water contamination and associated remediation systems. The other RCRA issue being resolved regards production of a large volume of leachate from the closed hazardous waste landfill.

This Five Year Review is limited to the soil remedy outside the RCRA closed hazardous waste landfill and does not include the ground water or the RCRA closed hazardous waste landfill as they are regulated through RCRA permit MND000686196.

In the early to mid-1990's, soil cleanup numbers were developed and a MPCA soil cleanup strategy was drafted for determining if a cleanup was protective of human health and the environment. In 1997 and 1998, MPCA final cleanup numbers and a cleanup policy were published by the Superfund Section and are maintained at the website http://www.pca.state.mn.us/cleanup/riskbasedoc.html.

In this Five Year Review, MPCA staff compares the results of analyses for soil samples collected prior to excavation with the following criteria:

1) Industrial and short term worker (STW) soil reference values (SRVs) for protection of human health through direct contact in an industrial setting; and
2) Tier 1 soil leaching values (SLVs), which are screening numbers for preventing leaching to ground water above risk based groundwater standards and criteria, and where there are receptors within a two year ground water travel time. Receptors include surface water bodies and ground water users. If Tier 1 SLVs are exceeded, then Tier 2 SLVs are calculated using site specific hydrogeological information.

The soil excavation in 1985 at the site was based on visual contamination removal criteria. Currently there is insufficient data to evaluate the remaining soil, therefore confirmation sampling is recommended in affected areas of the Site. Once the data is evaluated, a determination on protectiveness will be made in a Five Year Review Amendment.

A scope of work to collect additional soil data was drafted by the MPCA staff. Initially, it was anticipated that the MPCA would perform this work under a Cooperative Agreement; however, BNSF has agreed to perform the work through their consultant, RETEC. Work will be overseen by MPCA, in consultation with USEPA. The anticipated date for completion of the amendment is October 30, 2004.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: **Burlington Northern (Brainerd/Baxter Plant)**

EPA ID *(from WasteLAN)*: MND000686196

Region: 5	**State: MN**	**City/County:** Baxter/Brainerd, Crow Wing County

SITE STATUS

NPL status: G **Final** G Deleted G Other (specify)

Remediation status (choose all that apply): G Under Construction G Operating G **Complete**

Multiple OUs?* G YES G **NO**	**Construction completion date:** 09 / 18 / 1995

Has site been put into reuse? G YES G **NO**

REVIEW STATUS

Lead agency: G EPA G **State** G Tribe G Other Federal Agency

Author name: Susan Johnson, Barb Gnabasik

Author title: Project Manager, Hydrogeologist	**Author affiliation:** Minnesota Pollution Control Agency

Review period:** 01 / 10 / 2003 to 09 / 30 / 2003

Date(s) of site inspection: 05 / 01 / 2003

Type of review: G Post-SARA G **Pre-SARA** G NPL-Removal only
G Non-NPL Remedial Action Site G **NPL State/Tribe-lead** G Regional Discretion

Review number: G 1 (first) G 2 (second) G **3 (third)** G Other (specify)

Triggering action:

G Actual RA Onsite Construction at OU #____ G Actual RA Start at OU#____

G Construction Completion G **Previous Five-Year Review Report** G Other (specify)

Triggering action date *(from WasteLAN)*: 03 / 13 / 1998

Due date *(five years after triggering action date)*: 03 / 13 / 2003

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

This Five Year Review consists of reviewing the soils component of the remedy. The closed hazardous waste landfill and ground water issues are being addressed under RCRA Permit No. MND000686196. The following concerns are present at the Site:

1. Insufficient data to fully evaluate the protectiveness of the on-site soils in the affected areas.
2. Currently, only the closed hazardous waste landfill is fenced at the Site.

Recommendations and Follow-up Actions:

- Collect confirmation samples of the non-visibly contaminated soil in the affected areas of the Site. In addition, information and/or soil sampling is needed to evaluate the soil under the former lagoons as part of the soil component.
- If new sampling data shows soil concentrations above residential values, restrict access by fencing impacted areas.

Protectiveness Statement(s):

The soil excavation in 1985 at the site was based on visual contamination removal criteria. Currently there is insufficient data to evaluate the remaining soil, therefore confirmation sampling is recommended in affected areas of the Site. Once the data is evaluated, a determination on protectiveness will be made in a Five Year Review Amendment.

A scope of work to collect additional soil data was drafted by the MPCA staff. Initially, it was anticipated that the MPCA would perform this work under a Cooperative Agreement; however, BNSF has agreed to perform the work through their consultant, RETEC. Work will be overseen by MPCA, in consultation with USEPA. The anticipated date for completion of the amendment is October 30, 2004.

Other Comments:

Although not part of the Five Year Review, redevelopment of the Site may occur in the near future. These issues are being handled by RCRA staff from the MPCA.

Five-Year Review Report

I. Introduction

The purpose of this five-year review of the Burlington Northern Tie Plant (Brainerd/Baxter Plant) is to determine whether the remedy at this Site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

At the request of the USEPA, Region 5, the MPCA is preparing this five-year review pursuant to CERCLA § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section (104) or (106), the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The designated MPCA State Project Manager (SPM) and the State Hydrogeologist, with the assistance from the USEPA Region 5, have conducted a five-year review of the remedial actions implemented at the Site located in Brainerd/Baxter MN. This report documents the results of the review and the inspection conducted by the MPCA staff. USEPA delegated and funded the work through a cooperative agreement.

This review commenced on January 10, 2003 and MPCA staff completed the review in September 2003. This report documents the results of the review. The site inspection was conducted on May 1, 2003, by MPCA staff.

This is the third statutory five-year review for the Site. The triggering action for this review is the date of the last 5 year review conducted in March 1998. The five-year review is required because hazardous substances, pollutants, or contaminants are above levels that allow for unlimited use remain at the Site.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Complete Date
Burlington Northern Tie Plant Site Discovered	12/31/74
National Priorities List (NPL) Site Listing Proposal	07/16/82
Notice Letters Issued by MPCA	10/05/82
RA (Wastewater removed from lagoons, treated)	12/31/82
Final Listing on NPL	09/08/83
Remedial Action (NPDES Permit)	1984
PRP Remedial Investigation/Feasible Study (RI/FS)	02/84
Administration Order on Consent by MPCA and USEPA	04/04/85
On-Site Construction (RA) Land Treatment Unit Constructed	12/31/85
On-Site Construction (RA) Wastewater, Creosote Removal	12/31/85
On-Site Construction (RA) Gradient Control Well System	10/85
Environmental Enforcement Document (ROD equivalent)	06/04/86
RCRA Permit Issued	12/86
Site Transferred to RCRA	03/19/91
RCRA Permit Reissued	9/92
Air Sparging Added as Treatment Response Action to Ground Water	1992
First Five – Year Remedy Assessment by USEPA	01/27/93
Final Inspection by USEPA	08/21/95
RA Report Submitted	10/20/95
Preliminary Close Out Report	09/18/95
State Environmental Real Estate Notice	1/08/96
Second Five – Year Review by US EPA	03/13/98
RCRA Permit Reissued	08/01/01
Third Five-Year Review by MPCA	9/30/03

III. Background

Physical Characteristics

The former tie treating plant is located in Baxter, MN, just west of Brainerd. The Site is located on the corporate boundary between the cities of Baxter and Brainerd. State Highway 371 is approximately 900 feet north of the Site and the Mississippi River flows approximately 3,000 feet east of the Site. The Site is located in Sections 8 and 9, Township 133 North, Range 31 West. Residential areas are located less than 1000 feet from the Site to the northeast and southeast (see the Site Map, Attachment 1).

Three distinct glacial deposits are present at the BNSF facility. The upper most deposit is an aeolian sand. Locally this sand is known as "sugar sand" and is a fine, well sorted, loose sand. Occasionally ground water is perched in this unit; the lagoon water at the Site represented the surface expression of the perched unit. Generally, though, the aeolian deposits are unsaturated at the Site and range in thickness from 0 to 15 feet.

A coarse-grained sand and gravel glaciofluvial deposit underlies the aeolian deposits. These sands and gravels were deposited by melt waters from wasting glacial margins, and they range in thickness from 50 to 100 feet at the facility. The glaciofluvial deposits contain the primary regional aquifer in the area, supplying the municipal water systems of Brainerd and Baxter. At the BNSF facility, the water table in this unit is generally found within 20 feet of the ground surface. Ground water flow direction in this unit is predominately east, discharging to the Mississippi River.

The basal glacial deposit is a till which is a heterogeneous mixture of clay through gravel sized material. The till at the BNSF facility is a clayey sand with small amounts of gravel sized rock fragments. This till unit is a poor aquifer and, with the exception of isolated sand lenses, generally serves as a confining bed to ground water flow.

The bedrock unit at the Site is the Cuyuna Slate Member of the Crow Wing Formation. The Cuyuna Member is composed of green-gray cherty slate with schistose intrusives. This type of rock is a poor aquifer because of the low permeability and lack of open, interconnected fractures.

Land and Resource Use

The historic land use of the Site has involved railroad tie treating, loading and unloading of ties and timbers, timber storage and several railroad lines, some that are still active. Approximately half the property was used in the treating process, the other half was used for drying green timbers. The edges of the property are wooded and have sparse ground cover as the soil is very sandy.

The land is currently zoned industrial and is owned by BNSF. The surrounding land is bordered by commercial, light industrial and residential areas. Several local and state government bodies are seeking parts of the property for development, primarily to construct a connecting road to MN Highway 210, north of the Site. Interested parties include the Cities of

Brainerd and Baxter, Crow Wing County, Minnesota Department of Transportation (MNDOT), and Minnesota Department of Natural Resources (DNR). The proposed road extension transects the current closed hazardous waste landfill located both in Baxter and Brainerd. BNSF is considering removing the closed hazardous waste landfill completely, which is currently in the RCRA program. In the future, the Cities of Brainerd and Baxter and Crow Wing County want to consider development in the area for commercial use. The Site is currently not fenced except for the closed hazardous waste landfill and front gate. The groundwater treatment system is housed in three sheds.

The groundwater aquifer underlying the Site is currently being used as a water source to six well users. The groundwater flow direction is primarily east towards the Mississippi River.

A State Environmental Real Estate Notice was recorded at the Crow Wing County Recorder's Office and is documented in a letter from Burlington Northern dated January 8, 1996. The State Environmental Real Estate Notice documents the former use of the facilities, the presence of a RCRA closed hazardous waste landfill, and cleanup of sludge and of soils on a visual basis. The Notice is the institutional control for the Site.

History of Contamination

Burlington Northern Railroad, a predecessor to BNSF, operated the former tie treated plant in Brainerd, MN, from 1906 to 1986. The plant used creosote to preserve railroad ties. Starting in the 1950s, creosote was diluted using a 50:50 mixture with either diesel fuel Nos. 5 or 6 to preserve railroad ties. At some indeterminate time later, coal tar was used to dilute creosote using a 70% creosote to 30% coal tar mixture. Pentachlorophenol was not used in the treatment process at the Site. Wastewaters from the wood preserving operations were sent to two unlined surface impoundments for disposal. The first impoundment was used until the 1930s known as the CERCLA lagoon; see Attachment 2, Pre-construction Map. At that time, the second impoundment was built, known as the RCRA lagoon. The second impoundment was used until October 1982, when a wastewater treatment plant was completed. From approximately 1980 through 1986, remedial investigations (RI) were conducted at the Site. Based on the results of the RI, soils and groundwater beneath the impoundments or lagoons were found to be impacted with PAH compounds, salts, oils, and phenolic compounds.

Initial Response

The primary groundwater contaminant sources were the two shallow lagoons, which were used to hold process wastewater from the process area. Between the opening of the plant and October 1982, wastewater was discharged to either the RCRA or the CERCLA lagoons. USEPA proposed this Site for its National Priorities List (NPL) of hazardous waste sites on December 30, 1982 and it was finalized on September 8, 1983. Burlington Northern began the site cleanup as a Superfund Remedial action pursuant to a CERCLA Section 106 Consent Order.

All of the wastewater and liquid creosote were removed from the RCRA lagoon. The creosote was removed between 1982 and 1985 and reused or recycled. The wastewater was pumped to rail-tank cars and transported to Burlington Northern's Northtown, Minnesota

wastewater treatment plant for pretreatment and subsequent discharge to the sanitary sewer in 1982.

Other milestone dates include the RI report and Feasibility Study (FS), which were completed in 1984 and a public health assessment, which was completed in 1986. A 106 Order Consent Agreement was signed on April 4, 1985, which identified the specific requirements for conducting additional remedial investigations. The signatories of the Agreement were MPCA, US EPA, and Burlington Northern Railroad.

Basis for Taking Action

Based on the results of remedial investigations, soils and groundwater beneath the impoundments were found to be impacted with PAH compounds, salts, oils, and phenolic compounds.

Nine carcinogenic PAHs are known or suspected which are:

LIST 1	
benzo(a)anthracene	ideno(1,2,3-c,d)pyrene
benzo(b)fluoranthene	benzo(g,h,i)perylene
benzo(j)fluoranthene	dibenzo(a,h)anthracene
benzo(a)pyrene	quinoline
Chrysene	

Twenty-two non-carcinogenic PAHs and heterocycles are known or suspected which are:

LIST 2	
indene	fluoranthene
2,3-dihydroindene	pyrene
naphthalene	benzo(h)fluoranthene
1-methylnaphthalene	benzo(e)pyrene
2-methylnaphthalene	perylene
biphenyl	acridine
acenaphthylene	carbazole
acenaphthene	2,3-benzofuran
fluorene	benzo(b)thiophene
phenanthrene	dibenzothiophene
anthracene	indole

Benzene extractables, an oil and grease method, also was analyzed historically due to high concentrations in soils. The specific reference is "Oil and Grease, Soxhlet Extraction Method", Standard Methods for Examination of Water and Wastewaters, 15th Edition, Procedure 503C. The method involved substituting benzene for Freon to Soxhlet extract the air-dried soil sample(s).

IV. Remedial Actions

Remedy Selection

The EDD for the Burlington Northern Tie Plant was signed June 4, 1986, by the USEPA. This document requires the on-site land treatment of sludges and visibly contaminated soil from both impoundments and the treatment storage and staging areas.

The selected alternative was on-site treatment of creosote sludges and contaminated soils at the Site, and included the following major component objectives stated in the 1986 EDD:

- Preparation of lined staging area for temporary storage of the sludge and contaminated soil;
- Removal of all standing water in the RCRA lagoon impoundment;
- Excavation and segregation of the sludges for subsequent free oil recovery;
- Excavation of visibly contaminated soil from both impoundments and subsequent storage in the staging area, the excavation areas will be backfilled and covered;
- Preparation of a base for treatment consisting of 4 feet of clean backfill with on-site soils, a 100-mil high density polyethylene (HDPE) liner, a leachate collection system, and 4 feet of clean backfill consisting of on-site soils (fine sands);
- Installation of a sump for collection of storm water and leachate;
- Installation of an irrigation system;
- The land treatment of creosote focuses on the breakdown and transformation of organic constituents by aerobic microorganisms in the top layer of soil, and the immobilization of organic and inorganic constituents in the soil. The final goal of this treatment is not the complete degradation of all waste constituents, but is rather the transformation and immobilization of these constituents to render soil that is no longer toxic and does not leach harmful constituents. The estimated time to process the contaminated materials is six years;
- After the treatment process has been completed, a final RCRA approved cover will be installed; and
- The ground water gradient control system will remove the ground water contamination found in a small area downgradient from the Site.

The land treatment unit, using degradation of organic constituents by aerobic microorganisms, did not reach the target treatment goal of the original EDD. Therefore, a decision was made by the USEPA and MPCA staff to cap the treated material in place. Subsequently a closed hazardous waste landfill was formed in the fall of 1995.

The first RCRA permit overseeing the soil treatment area, groundwater pump out system and groundwater monitoring system was issued in 1987. In 1991, after the soil removal and placement into the LTU, the Site was transferred into the RCRA program to avoid duplication of effort between RCRA and Superfund.

Remedy Implementation

There is one OU defined for the Site but two separate components exist which include: (1) the ground water; and (2) the contaminated soils and hazardous wastes.

Ground Water Remedy

The groundwater gradient control system was installed in fall of 1985. Contaminated ground water was pumped from three gradient control wells on the property and discharged to the city storm water system via a NPDES permit. The city storm water system ultimately discharges to the Mississippi River. In February 1991, MPCA's Site Response Section transferred the oversight responsibility of the Site to the Hazardous Waste Division's Regulatory Compliance Section. Since that time, the groundwater remedy has been carried out by the RCRA program, Permit MND000686196. While the groundwater remedy is under RCRA authority, it is being summarized here for purposes of this five-year review.

Ground water aeration was implemented as an augmentation to the three gradient control wells in 1992. The ground water aeration system started with nine air injection wells to facilitate biological breakdown of the contaminants so the NPDES limit for naphthalene could be met. An additional thirteen air sparge wells were placed in the fall of 1995 to aerate the width of the contamination plume while pumping gradient control wells GC-1 to GC-2. Ground water quality data from GC-1, GC-2, and GC-3 showed significant decreases in naphthalene concentrations in the pump out wells since the sparge wells were placed.

On October 24, 1996, Anthony Rutter from the USEPA approved the use of the Microbial Fence air sparging system in place of the gradient control system as the groundwater remediation system.

The Part B RCRA permit was revised in August 2001. The August 2001 permit requires that the facility have two points of compliance: the regulated unit point of compliance (Wells MW-3A, 3B, 3C, 19 and 20); and the corrective action point of compliance (wells MW-14B and 15). Well MW-13B was added to the list of monitoring wells for the corrective action point of compliance in the 2001 Permit. The regulated unit point of compliance wells are monitored annually during the third quarter under the 2001 RCRA Part B permit. The corrective action point of compliance wells are sampled quarterly. Monitoring wells MW-4B, MW-13C, MW-23A, MW-23C, MW-24A, and MW-24C are used as observation wells and are sampled quarterly. Ground water elevations are measured quarterly in all wells.

The 2001 RCRA Part B Permit authorized shut off of the gradient control well system on December 20, 2001, and provided for the air sparging system replacing the three extraction wells if permit levels are not exceeded at compliance points, all located south and southeast of the site. Since December 20, 2001, the 22 air sparge wells operated without the three gradient control wells for contaminated ground water treatment. The conditions for ceasing pumping the gradient control wells were that no Permit action levels be exceeded at the corrective action compliance boundary.

Gradient control well shut off was followed by the implementation of the monthly groundwater monitoring program for a total of six months. Corrective action point of compliance wells MW-13B, MW-14B, and MW-15, which were located downgradient of the gradient control system, while being pumped, were sampled monthly for six months to monitor concentration changes in the aquifer after the gradient control wells were turned off. In 2001 and 2002, there were 21 monitoring wells at the BNSF facility. Several monitoring wells, MW-21, MW-22, MW-23A, MW23C, MW-24A, and MW-24C were installed for monitoring performance of the air sparge system.

The 2001 permit also requires that the extraction wells will remain in place and be maintained, the reason being that should contaminant levels rise due to deterioration in the air sparging system, they can be activated and contain the plume and then discharge the pumped water to the river or divert it to the sanitary district if NPDES permit levels are exceeded at compliance points. Ground water corrective action must continue at the facility until the ground water protection standards are met at the regulated unit point of compliance. The ground water protection standards must not be exceeded at the corrective action compliance boundary.

At the present time, the air sparging system is operating without the gradient control wells pumping. There are issues that are in the process of resolution regarding part of the plume migrating eastward towards the Mississippi River without treatment north of the air sparging system. The issues include the need for plume capture, its stability, extent, and magnitude. As part of this resolution, a new well nest and 7 single wells were added to further define whether all the ground water was being treated by the air sparging system and to provide additional plume data for the portion bypassing treatment. An updated well survey is due to the MPCA staff on October 15, 2003. Work is on-going and will likely result in more wells being installed. In addition, there is an issue regarding the large volume of leachate production from the closed hazardous waste landfill that needs further investigation. These issues are handled under the RCRA permit.

Soil Remedy

In 1984 bench and pilot scale tests were conducted to evaluate the feasibility of using bioremediation to remediate the contaminated soils and sludges from the lagoons. The study consisted of six pilot scale test plots and six bench scale reactors which varied in the initial creosote concentration. These tests were successful and a full scale treatment system was designed and constructed in August 1985. Oily wastes were excavated from the two disposal ponds at the Site in 1985 and stockpiled for treatment adjacent to BNSF's land treatment unit that was also constructed in 1985. Excavated areas were backfilled with clean fill from two unused portions of the site.

The treatment area consisted of a four foot base of clean backfill, a 100 ml high density polyethylene liner and a leachate collection system. A lined staging area was prepared for the temporary storage of the sludge and contaminated soil. Between 1100 and 1500 cubic yards of soil were added to the treatment area each year. Treatment included:

1. Periodic monitoring of PAHs, total phenols, benzene extractables and toxicity parameters;
2. Application of lime and nutrients as necessary to meet design criteria;
3. Periodic irrigation to maintain the treatment zone near field capacity;
4. Bi-weekly cultivation with a tractor mounted rototiller; and
5. Maintenance of the leachate collection and run-off sumps.

A total of 14,000 cubic yards of contaminated soils were treated in the land treatment unit. About 7,000 cubic yards of soils were excavated from the former RCRA lagoon, 2,500 cubic yards were excavated from the former CERCLA lagoon, 3,500 cubic yards were excavated from other impacted areas and 1,000 cubic yards of sand, gravel and soil from the stockpile closure activities were placed in the treatment area. A summary of all materials and soils remediated are presented in Table 2.

Table 2: Remedial Activities Summary for Miscellaneous Site/Soil Materials
Former BNRR Tie Treating Plant
Brainerd, Minnesota

SWMU Location	Activity	Date	Material Description	Estimated Volume	Treatment Method	Location
Process and Storage Areas						
Concrete Building Foundations	Demolition	1989	Concrete	1,533 CY	Crushing	LTU
Process Piping and Debris	Removal	1989	Steel	12 CY	Off-site disposal	Ft. Wayne, IN
Concrete Tank Foundations	Demolition	1992	Concrete	170 CY	Crushing	LTU
Rebar Reinforcement	Removal	1992	Steel	2 Tons	Off-site recycling	Scrap Yard
Impacted Soil	Excavation	1989	Impacted Soil	2,674 CY	On-site land treatment	LTU
Drip Track Area						
Impacted Soil	Excavation	1989	Impacted Soil	238 CY	On-site land treatment	LTU
Black Dock Area						
Railroad Ties	Removal	1991	Treated Wood	100 CY	Off-site recycling	Braxton Industries Bovey, MN
Miscellaneous Debris	Removal	1991	Steel	NA	Off-site recycling	Scrap yard
Impacted Soil	Excavation	1991	Impacted Soil	640 CY	On-site land treatment	LTU
Temporary Stockpile Area						
Residual Water and Leachate	Removal	1994	Liquid	NA	Brainerd POTW	Brainerd, MN
Miscellaneous Debris	Removal	1994	Steel and plastic	34,680 LB	Off-site disposal	Chemical Waste Management Model City, NY
Impacted Soil	Removal	1994	Impacted Soil	1,250 CY	On-site land treatment	LTU
Geotextile Material	Removal	1994	Plastic	11,560 LB	Off-site disposal	Chemical Waste Management Model City, NY
Leachate Collection Materials	Removal	1994	Sand and Gravel	1,050 CY	On-site land treatment	LTU

HPDE Liner	Removal	1994	Plastic	46 CY	Decontamination and On-site disposal	LTU
Impacted Soil Beneath Sump	Removal	1994	Impacted Soil	40 CY	On-site land treatment	LTU
Leachate Collection Materials	Removal	1994	Cobbles	260 CY	On-site disposal	LTU
Leachate Collection Sump	Removal	1994	Plastic	320 LF	On-site disposal	LTU

NA – not available

Performance standards for the soil treatment were based in part on significant reductions in total extractable hydrocarbons. A treatability study was completed that indicated that these standards could be achieved. Due to time limitations of the study, it was not discovered until several years of full-scale treatment had been completed that a "plateau" effect would limit the extent of biodegradation of the total extractable hydrocarbons. Based on full-scale monitoring data, it was observed that the rate of biodegradation of total extractable hydrocarbons continued only to a concentration that was slightly above the target treatment goal. Thus the target treatment goal for total extractable hydrocarbons could not be met. The performance standards were also based on a qualitative toxicity standard measured by the Microtox™ analysis and was not rendered nontoxic. An evaluation of the monitoring data indicated that the residual creosote constituents were biostabilized despite the higher than expected residual total extractable hydrocarbon levels and toxicity levels. A decision was made by the USEPA and the MPCA to cap the treated material in place.

A RCRA permit was issued in December 1986 for the closure of the surface impoundment, for land treatment at the former surface lagoon, and for a temporary stockpile that stored the contaminated soil until it could be treated. Oversight of soil treatment and the groundwater gradient control system was transferred to the RCRA program at the MPCA in February of 1991. A final RCRA cover over the land treatment unit was placed in the fall of 1995 and the revised post closure plan was submitted in September 1995. The RCRA permit was reissued in September 1992 and in August 2001.

System Operations/O&M

O&M activities are administered under the RCRA permit for this Site.

The most recent RCRA O&M ground water field inspection was conducted July 9, 2002, by Barbara Gnabasik of the MPCA staff. Ron Holm and Jim Brown of RETEC conducted the ground water sampling for BNSF. No violations were noted during the O&M review. However, MPCA staff requested two changes to the monitoring program for the Site to determine if the air sparging remedy remains effective in treating the plume:

- An additional well nest was installed north of the monitoring well (MW) MW-4 and east of the MW-3B and MW-3C. With the shut off of the gradient control wells in 2001, the flow direction has become more easterly than previously. The Well Map (Attachment 3) shows well MW-6 is too far away and contamination could slip through between MW-15 and MW-6. BNSF has installed this well nest in February 2003. The well nest was sampled and DRO, GRO, and naphthalene concentrations were found to be elevated.

- MPCA staff requested that all the wells monitored at least annually be sampled once, as part of each well's next sampling event, and for DROs and GROs using the Wisconsin Modified DRO and GRO Methods. A Minnesota Department of Health (MDH) Health Based Value (HBV) was developed at the end of 1999 at 200 micrograms per liter (ug/L) for DRO and GRO and information is needed to determine if this HBV is being exceeded. This work was performed by BNSF. DRO and, to a much lesser degree, GRO, were found to be migrating without air sparging treatment at the Site. Additional work is needed to determine if the plume is unstable or is migrating off the property. In addition, DRO and GRO need to be added to the list of monitoring program sampling parameters. The RCRA Program also is addressing this issue.

Since the new well nest was installed, seven additional wells were installed and the wells were sampled. Further investigation of the plume's extent, magnitude, and stability and the potential changes to the ground water remedy is on-going. The updated receptor survey is due October 15, 2003. The RCRA program is handling these issues.

V. Progress Since the Last Review

No actions have been taken for the soil remedy since the last five-year review. However, confirmatory soil samples are needed from the Site to determine protectiveness and a statement of work is being developed to perform this work.

The RCRA permit for this Site, including operation and maintenance of the closed hazardous waste landfill and groundwater monitoring requirements, was reissued in August 2001.

VI. Five-Year Review Process

Administrative Components

Potentially interested parties including BNSF, MPCA and USEPA management and staff counterparts were notified of the initiation of the five-year review in December 2002. The MPCA is the lead agency for the Site and the five-year review was led by the Site team, Susan Johnson, Project Leader, and Barbara Gnabasik, Hydrogeologist. Representatives of USEPA Region 5 included Linda Kern, Regional Project Manager, and Rosita Clarke, five-year review Coordinator. Other members of the review team included: Steve Mikkleson, MPCA Public Information Officer, and Crystal Gilbertson, MPCA student worker.

From December 31, 2002, to January 30, 2003, the review team established the review schedule whose components included: community involvement, document review, data review, interviews, site inspection, and five-year review report development.

Community Involvement/Notification

MPCA issued a press release on January 10, 2003, that announced the initiation of the five-year review and solicited written comments from the public. The comments can be found in

Attachment 4. Minnesota Public Radio conducted an interview with the state project manager on January 10, 2003.

Telephone interviews were conducted with selected members of the BNSF site mailing list; see Attachment 5 for survey questions and results.

These members represent nearby site residences, City of Brainerd and Baxter officials, Crow Wing County officials, State natural resource officials, a local environmental action group, and a snowmobile club. Issues brought up in the interview mostly pertained to future land use and lack of information available about the Site.

The property is located adjacent to a main city highway and a business district. Multiple entities have expressed interest in developing the property, though BNSF has not sold any site property at the time of this review. The Minnesota Department of Transportation has condemned a small strip at the northern end of the property for a state highway development.

All the participants thought a site information webpage would be very beneficial. The MPCA has plans to support a site specific webpage from the MPCA website. Notification to the mailing list will alert interested parties to the webpage.

A newspaper add will be placed in the local paper indicating that a five-year review has been completed for the Site and is available at the MPCA-Brainerd office at 1800 College Road South, Baxter, MN, 56425.

Four formal comments were received by the MPCA in conjunction with the five year review. Three comments supported changes to future land use and the third requested more information about groundwater characteristics at the Site.

Document Review

Documents reviewed for this five-year review are referenced in Attachment 6. The ground water and the closed hazardous waste landfill are being addressed through the RCRA program permit MND000686196 that contains closed hazardous waste landfill operations and maintenance requirements and ground water monitoring requirements. The RCRA permit is re-issued every five years and is updated at the time of re-issuance. Applicable soil cleanup standards, as listed in the 1986 EDD were also reviewed.

Data Review

Refer to the Technical Assessment Portion of this five-year review for more detailed information and to Attachment 4 for the list of documents reviewed.

Site Inspection

A site inspection was completed on May 1, 2003, by Susan Johnson and Barbara Gnabasik. The purpose of the inspection was to assess the protectiveness of the remedy, including a visual inspection of the entire property. The remedy was carried out fifteen years ago and evidence of a former tie treating facility was difficult to find. Only one building remains on Site and is used to house groundwater sampling equipment and records. The Site is restricted by

a fenced gate across the former plant entrance and a fenced, three acre area surrounding the closed hazardous waste landfill. The remainder of the Site is not fenced. The groundwater pumps are housed either in metal or wood sheds. Monitoring wells were properly secured but need better identification as the well numbers written on the casing and observed on the wells during the RCRA site inspection last year have worn off. MPCA staff will request that an engraving pen be used to mark each well's identity on steel bands that should be attached to each well's casing. See Attachment 7 for site photographs.

No issues were identified regarding the soil remedy at the Site. Ground cover was somewhat sparse however; this is typical of very sandy soil native to the area. Two borrow pits used to backfill excavated areas were observed and were not actively used for any other purpose. Evidence of trespassing was found and is somewhat common according to the Site manager. There was also some evidence of all terrain vehicle traffic. The Site is relatively flat and no erosion problems were observed.

The MPCA conducted a limited private well survey based on a 1985 BNSF survey by reviewing well information, county well index and confirmation with a site visit. Below are the six wells which BNSF identified in 1985 near the Site and their well use at that time:

Table 3: Well Use Information

1985 Site Name	2003 Site Name	Current well use
Brainerd Junior College	Central Lakes College	city water, no well use
The Long Residence	Long Construction	city water, no well use
The Smith Residence	E.A. Smith-current resident?	Uncertain of address
Harold's Club	vacant lot	no well located
Mr. Lewie's Used Cars and Trucks	Dondelinger Chev-Cad-Toyota Inc.	Well used for all needs on the property.
Brainerd Beverage	No longer in business	Uncertain of address

The 1985 well survey did not include address information for these six locations, therefore, current well locations are questionable. Under a RCRA action BNSF is conducting an updated well survey and the information will be submitted on October 15, 2003.

VII. Technical Assessment

The RCRA closed hazardous waste landfill and ground water remediation system is being addressed under RCRA permit number MND000686196, so further discussion of these components are not included in this five-year review.

Question A: Is the remedy functioning as intended by the decision documents?

The remedy is functioning as designed by the EDD and the Consent Decree. However, based on the review of documents in the file and discussions with the former staff for the Site,

additional soil data is needed for the Site to determine if the remedy is protective of human health and the environment.

The remedy for soils with visible contamination and sludge was excavation. It is not clear if sludge and soils with visible contamination were excavated from within and below the water table. Soil that was visibly non-contaminated was not excavated as it was felt, based on analytical data, that the concentrations of contaminants were low enough to not represent a concern for exposure to human health and the environment. According to the former staff assigned to the Site at the time of the excavation, visibly contaminated soils and sludges below the water table also were not excavated. No sludges or visibly impacted soils were intended to continue to provide a direct contact route of exposure through inhalation, ingestion, and dermal contact. Any leaching impacts to ground water from soils below the water table were to be addressed by pumping the three gradient control wells. Since the EDD was written, calculations of contaminant specific human health based SRVs and SLVs were drafted and have been in use for the last five years. The website where these "TBC" cleanup values are available is http://www.pca state.mn.us/cleanup/riskbasedoc.html. The SRVs for direct contact through inhalation, ingestion, and dermal contact are based on the USEPA Risk Assessment Guidance, the information for specific contaminants in the Integrated Risk Information System (IRIS) data base, and a 10^{-5} risk level. The soil leaching values are based on Minn. Rule ch. 7060 and the Seasonal Soil Compartment Model (SESOIL), which was calibrated using data specific to Minnesota.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Numerical soil cleanup standards had not been developed for the contaminants of concern in Minnesota at the time of the EDD. Instead, any sludges and visible soil contamination above the water table were excavated. It is unclear if sludges and visibly contaminated soils at and below the water table were excavated. Soils and sludges, that were excavated, were bioremediated but did not pass the biotoxicity test. Therefore, the sludges and soils in the land treatment unit were covered with a RCRA type cover, and the liner, cover, and sump became the RCRA closed hazardous waste landfill. The staging pile was closed.

Cleanup levels for soils and sludges have changed from a visible cleanup level above the water table to risk based, direct contact TBC criteria and leaching level criteria above the water table. The changes to these levels are summarized in Appendix A. The newer cleanup levels are "TBC" as were the old soil cleanup level of cleaning up sludge and visible soil contamination possibly to a depth of above the water table. The new cleanup levels are based on the potential for leaching to ground water, and SRVs that protect human health against ingestion, inhalation, and dermal contact of contaminants above risk based levels. The SRVs that are used at a Site are dependent on the current zoning, planned immediate future use, and current land use at the Site and the surrounding area. The re-sampling of soils effort will provide data to determine if the present concentrations of contaminants in soils will be protective of human health and the environment for those areas not currently under the RCRA closed hazardous waste landfill. It also will provide the leaching potential and the risk to receptors. For soil samples to be collected below the water table in the areas of the RCRA and CERCLA Lagoons, and the pipelines, it will

provide an idea of the concentrations of contaminants and if any sludge remains, except where the RCRA closed hazardous waste landfill overlies the RCRA Lagoon. It is estimated that it will take twelve months to perform the work and finalize a report of the additional soil sampling results.

Land use has not changed to date, although there are proposals to redevelop the area. Any changes to date will be addressed through a five-year review amendment and after the soil sampling results become available. There are no changes to human health or ecological routes of exposure or receptors that affect the protectiveness of the remedy. Also, there are no newly identified contaminants, contaminant sources, or unanticipated toxic byproducts. Physical site conditions or the understanding of these conditions have not changed in a way that could affect the protectiveness of the remedy

Using toxicity factors and the risk assessment guidance in a combined approach were applied after the EDD was adopted for soils. MPCA staff sees the use of toxicity factors and risk assessment guidance as major changes that affect clean up goals for a site. No other contaminant characteristics have changed in a way that could affect the protectiveness of the remedy. A summary of the new soil TBCs are provided in Appendix A.

There are no changes for Action or Location Specific Requirements for the Site.

The remedy involved excavation of hazardous wastes and visibly contaminated soils and on-site treatment. Visually non-contaminated soils were not excavated. Based on information from former MPCA staff assigned to the Site at the time of the excavation, sludges and visibly contaminated soils were not excavated where found below the water table. No confirmation samples were collected for soils left in place after excavation of sludge and visibly contaminated soils above the water-table. Samples of sludges, visually contaminated soils, and visually non-contaminated soil samples were collected prior to excavation. The soil results from the visually non-contaminated soils exceed current cleanup levels for many of the contaminants of concern. Visually non-contaminated soils are described on Page 2-5 in the Closure Plan (September 1985) as being "lightly stained, yellow to brown in color, and may have a slight creosote odor." Additionally, they are described in the December 1987 Site Investigation Report as containing benzene extractable hydrocarbon contents of less than four percent, and total PAH concentrations of less than 10,000 mg/kg. Visually contaminated soils also are described in the same report. Generally, visually contaminated soils had a strong creosote odor, were dark brown to black in color, contained benzene extractable hydrocarbon contents greater than four percent by weight, and total PAH concentrations greater than 10,000 mg/kg, Appendix A.

In Appendices B through D, MPCA staff compares the new TBCs for soil to the concentrations of visibly non-contaminated soils, where divided in this manner. While it is stated that excavation of all sludge and visible soil contamination occurred, documentation of the excavation through surveying and confirmation sampling was not conducted. Consequently, it is unknown and not documented as to what was actually excavated. For the RCRA and CERCLA lagoons, the Black Dock Area, the Process Area, and the Drip Track Area, MPCA staff used the visibly non-contaminated soil concentrations for purposes of comparison. For the Conveyance Trench, MPCA staff used the maximum soil concentrations detected (not sludges) prior to excavation for comparison with the new TBCs for soils. Visually contaminated soil

concentrations may have been used in this part of the table. Based on review of the comparisons in Appendices B-D:

- Only select Semi-Volatile Organic Compound (SVOCs) were analyzed and the heterocycles are missing from this list; Total phenol also is missing from some sampling locations
- Only one sludge, one visibly contaminated and one visibly non-contaminated soil samples were collected and analyzed for select metals and these soil samples were all from the RCRA lagoon area. The metals analyzed are listed below in Appendix B. The results summarized in the table below are for a single sample of the soils underlying visually contaminated soils.
- Seventeen organic contaminants were not included in the analyses of soil samples. The seventeen organic contaminants include: 2,4-dimethylphenol; 2,4-dinitrophenol; 2-methylphenol; 3-methylphenol; 4-methylphenol; 2,3-benzofuran; indene; indole; 2,3-dihydroindene; 1-methylnaphthalene; 2-methylnaphthalene; benzo(b)thiophene, carbazole; biphenyl; 2-nitrophenol; 4-nitrophenol; and DRO/GRO. Also, total phenol analysis is missing for the Process, Black Dock, and Drip Track Areas.

For the visibly non-contaminated soils in the area of the RCRA Lagoon, as shown in Appendix B, four contaminants exceeded the Tier 1 SLVs: naphthalene; acenaphthene; carcinogenic PAHs, and thallium. In addition, seven industrial or short-term worker (STW) SRVs were exceeded: naphthalene; acenaphthene; fluorene; fluoranthene; pyrene; carcinogenic PAHs and phenol.

For the visibly non-contaminated soils in the area of the CERCLA Lagoon, as shown in Appendix C, eight contaminants exceeded the Tier 1 SLVs: total phenols; naphthalene; acenaphthalene; fluorene; anthracene; fluoranthene; pyrene; and carcinogenic PAHs. In addition, it is unknown for eight contaminants, if their respective industrial and STW SRVs were exceeded as no shallow soil samples were collected from 0 to 4 feet depth. The eight possible contaminants include: total phenols; naphthalene; acenaphthene; fluorene; anthracene; fluoranthene; pyrene; and carcinogenic PAHs.

For the conveyance trench, the following six contaminant concentrations exceeded the Tier 1 SLV: acenaphthene; fluorene; fluoranthene; naphthalene; pyrene; and carcinogenic PAHs. It is unknown if the industrial or STW SRVs are applicable as the soil contamination appears to start at a depth of six feet.

For the Process Area, Drip Track, and Black Dock areas, six contaminant concentrations exceeded the Tier 1 SLV. They are: naphthalene; acenaphthene; fluorene; fluoranthene; pyrene, and carcinogenic PAHs. No contaminant concentrations appear to exceed the industrial or STW SRVs, but then only six samples were collected from these areas.

Tier 1 SLVs that were exceeded in all areas include: naphthalene; acenaphthene; and carcinogenic PAHs. A similar statement can not be made for industrial or STW SRVs as some of the areas did not have soil samples collected from 0 to 4 feet depth.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No newly identified ecological risks have been found. There are no impacts from natural disasters.

Other information that may affect the remedy and its protectiveness, in the future, is that Crow Wing County and the cities of Brainerd and Baxter are negotiating with BNSF to have the RCRA closed hazardous waste landfill moved to allow County Highway 48 to extend through the area occupied by the RCRA closed hazardous waste landfill. This action is being handled in the RCRA program. However, possible unexcavated wastes and contaminated soils underlying the RCRA closed hazardous waste landfill and soils from other source areas, listed herein, are a CERCLA issue that remains and potentially needs to be addressed.

Technical Assessment Summary

In 1985, a cleanup of sludge and visually contaminated soils was conducted at the BN-Tie Plant from the various source areas. These source areas include the RCRA Lagoon, the CERCLA Lagoon, the Process Area, the Conveyance Trench, the Drip Track Area, and the Black Dock Area. Sludge and visually contaminated soils were excavated from above the water table in these source areas, were biological treated in a land treatment unit, and when Microtox™ criteria could not be met, were incorporated into a closed hazardous waste landfill. It is unknown if sludge and visually contaminated soils from at or below the water table was excavated. Thus, the intent was that no sludges or visibly impacted soils would continue to provide a direct contact route of exposure through inhalation, ingestion, and dermal contact. Visually non-contaminated soil and possibly soil from below the water table at the RCRA and CERCLA lagoons and some piping areas were not excavated. Soil that was visibly non-contaminated was not excavated as it was felt, based on analytical data, that the concentrations of contaminants were low enough to not represent a human health concern from direct contact. Any leaching impacts to ground water from soils with nonvisible soil contamination and leaching from wastes and contaminated soils below the water table were to be addressed by pumping the three gradient control wells as the ground water remedy. This was supplanted in December 2001 by an air sparging system.

The land treatment unit and ground water remediation part of the project was transferred to RCRA in 1991. USEPA Region V RCRA staff requires three year reviews, including field inspections and reports of the effectiveness and conditions of the ground water monitoring program, the remediation system, and site records. The most recent report is dated September 2002. USEPA Region V RCRA also requires that the closed hazardous waste landfill be inspected every two years and a report developed and sent to USEPA. So these issues as well as financial assurance are covered by RCRA under the BN-Tie Plant permit.

No confirmation soil samples were collected at the Site. However, sludge, visually contaminated soil, and visually non-contaminated soil samples were collected prior to

excavation. This includes the RCRA and CERCLA lagoons, the Drip Track Area, the Process Area, the Black Dock Area and the Conveyance Trench. The Conveyance Trench area had samples collected from 6 to 15 feet in depth and no shallow samples were taken. The sample results were used to compare with current MPCA soil standards.

The documentation of the excavation was very weak with reliance on some pre-excavation cross-sections and other limited information. Many borings only included definition of the sludges and visibly contaminated soils. Some borings in the RCRA and CERCLA lagoons showed the water table in the sludge or in the visually contaminated soils for these areas. Excavation volumes are given as gross area volumes, such as this excerpt from Table 2:

Black Dock Area

Impacted Soil	Excavation	1991	Impacted Soil	640 CY	On-site land treatment

This area is a large area roughly 600 feet by 50 feet. No excavation depths or specific locations within the area were documented.

In response to Question A, the remedy is functioning as designed by the EDD and the Consent Decree. However, it is unknown if the remedy is functioning to protect long-term human health and the environment, based on the review of documents in the file and based on discussion with the former staff for the Site.

In response to Question B, the EDD was prepared in 1985, prior to current risk assessment methodologies being developed, and prior to soil "TBC" criteria of soil leaching and direct soil contact through the inhalation, ingestion, and dermal exposure pathways were developed in 1995. Many visually non-contaminated soil exceed current cleanup levels for many of the contaminants of concern. Visually non-contaminated soils are described on Page 2-5 in the Closure Plan (September 1985) as being "lightly stained, yellow to brown in color, and may have a slight creosote odor." Additionally, they are described in the December 1987 Site Investigation Report as containing benzene extractable hydrocarbon contents of less than four percent, and total PAH concentrations of less than 10,000 mg/kg. Visually contaminated soils also are described in the December 1987 Site Investigation Report. Generally, visually contaminated soils had a strong creosote odor, were dark brown to black in color, contained benzene extractable hydrocarbon contents greater than four percent by weight, and total PAH concentrations greater than 10,000 mg/kg.

Since this EDD was written, calculations of contaminant specific human health based SRVs and soil leaching numbers were drafted and have been in use for the last five years. The website where these "TBC" cleanup and screening values are available is MPCA - Risk-Based Site Evaluation Process Guidance Documents. A summary of the "TBC" cleanup and screening values is located in Appendix A. The "TBC" cleanup values include the industrial and short-term worker SRVs, which apply to the top four feet of soils. The screening values include the Tier 1 SLVs. There is insufficient information to calculate Tier 2 SLVs, which can be cleanup levels, provided contamination is within a two year ground water travel time of receptors, such as private wells, public water supply wells, or surface water bodies, for example. There are no changes in action- or location-specific requirements.

Appendices B and C contain comparisons of the "TBC" cleanup and screening values, namely, the industrial and short-term worker SRVs and the Tier 1 SLVs, and the visibly non-contaminated soil concentrations in and adjoining the RCRA and CERCLA Lagoons, the Drip Track area, the Black Dock Area and Process Area. For the conveyance trench, the industrial and STW SRVs and Tier 1 SLVs were compared to both the visible and the visibly non-contaminated soil concentrations as there is insufficient information to determine how the two were split out and cleaned up. In addition, sampling for select metals also has been inadequate. In these Appendices, seventeen organic contaminants were not analyzed including many of the heterocycles currently being analyzed for in ground water and DRO, which is a primary contaminant of the soil samples. Total phenol also was not analyzed for the Process, Drip Track, and Black Dock areas. There are no changes in action- or location-specific requirements.

Based on the comparison, there are many Tier 1 SLVs that are exceeded for the visibly non-contaminated soils for these areas. Tier 1 SLVs that were exceeded in all on site source areas include: naphthalene; acenaphthene; and carcinogenic PAHs. For the RCRA lagoon, seven industrial or STW SRVs were exceeded by visually non-contaminated soils in the top four feet. For the CERCLA lagoon, the Drip Track and Black Dock areas, there were either an insufficient number or no soil samples that were visually non-contaminated and were located in the top four feet from the ground surface. For the Conveyance Trench, it is unknown if SRVs apply as the soil contamination appears to start at a depth of six feet below the ground surface.

A State Environmental Real Estate Notice was recorded at the Crow Wing County Recorder's Office and is documented in a letter from Burlington Northern dated January 8, 1996. The Environmental Land Use Notice documents the former use of the facilities, the RCRA closed hazardous waste landfill, and cleanup of sludge and soils to visual standards although it is unclear if sludges and soils were cleaned up at or below the water table for the RCRA and CERCLA lagoons and some piping locations.

To answer Question C, no other information has come to light that would call into question the protectiveness of the remedy of soil excavation as it presently exists. As stated above, the ground water and the closed hazardous waste landfill are being addressed under the RCRA program. There are proposals for future development of the property that would result in changes needed for the RCRA closed hazardous waste landfill, possibly for the ground water monitoring system, and in the zoning of the parcel, which affects the soil remedy. There are no changes in ecological risks or impacts from natural disasters.

VIII. Issues

Table 6: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. Insufficient data to fully evaluate the protectiveness of the on-site soils in the affected areas.	Y	Y
2. Currently, only the closed hazardous waste landfill is fenced at the Site.	N	Y

IX. Recommendations and Follow-up Actions

Table 7: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Future Protectiveness (Y/N)	
					Current	Future
More data needed to evaluate protectiveness.	Collect soil samples; compare results with current soil criteria in affected areas. In addition information and/or soil sampling is needed to evaluate soils under the former lagoons as part of the soil component.	BNSF	MPCA	September 30, 2004	Y	Y
Currently, only the closed hazardous waste landfill is fenced at the Site.	If new sampling data shows soil concentrations above residential values, restrict access by fencing impacted areas.	BNSF	MPCA	NA	N	Y

X. Protectiveness Statement(s)

The soil excavation in 1985 at the site was based on visual contamination removal criteria. Currently there is insufficient data to evaluate the remaining soil, therefore confirmation sampling is recommended in affected areas of the Site. Once the data is evaluated, a determination on protectiveness will be made in a Five Year Review Amendment.

A scope of work to collect additional soil data was drafted by the MPCA staff. Initially, it was anticipated that the MPCA would perform this work under a Cooperative Agreement; however, BNSF has agreed to perform the work through their consultant, RETEC. Work will be overseen by MPCA, in consultation with EPA. The anticipated date for completion of the amendment is October 30, 2004.

XI. Next Review

The next five-year review will be conducted five years from the date of this review.

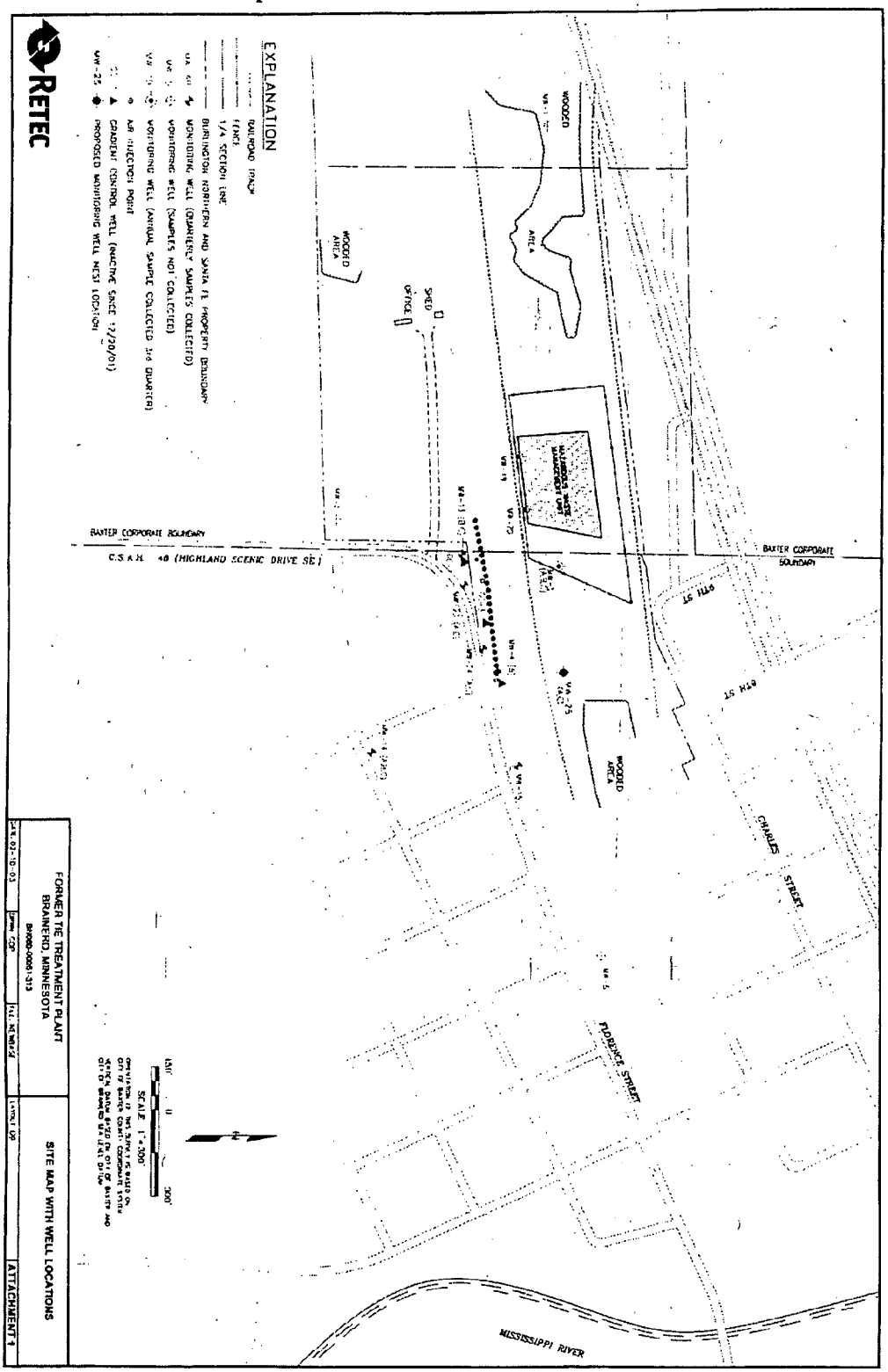
Attachments

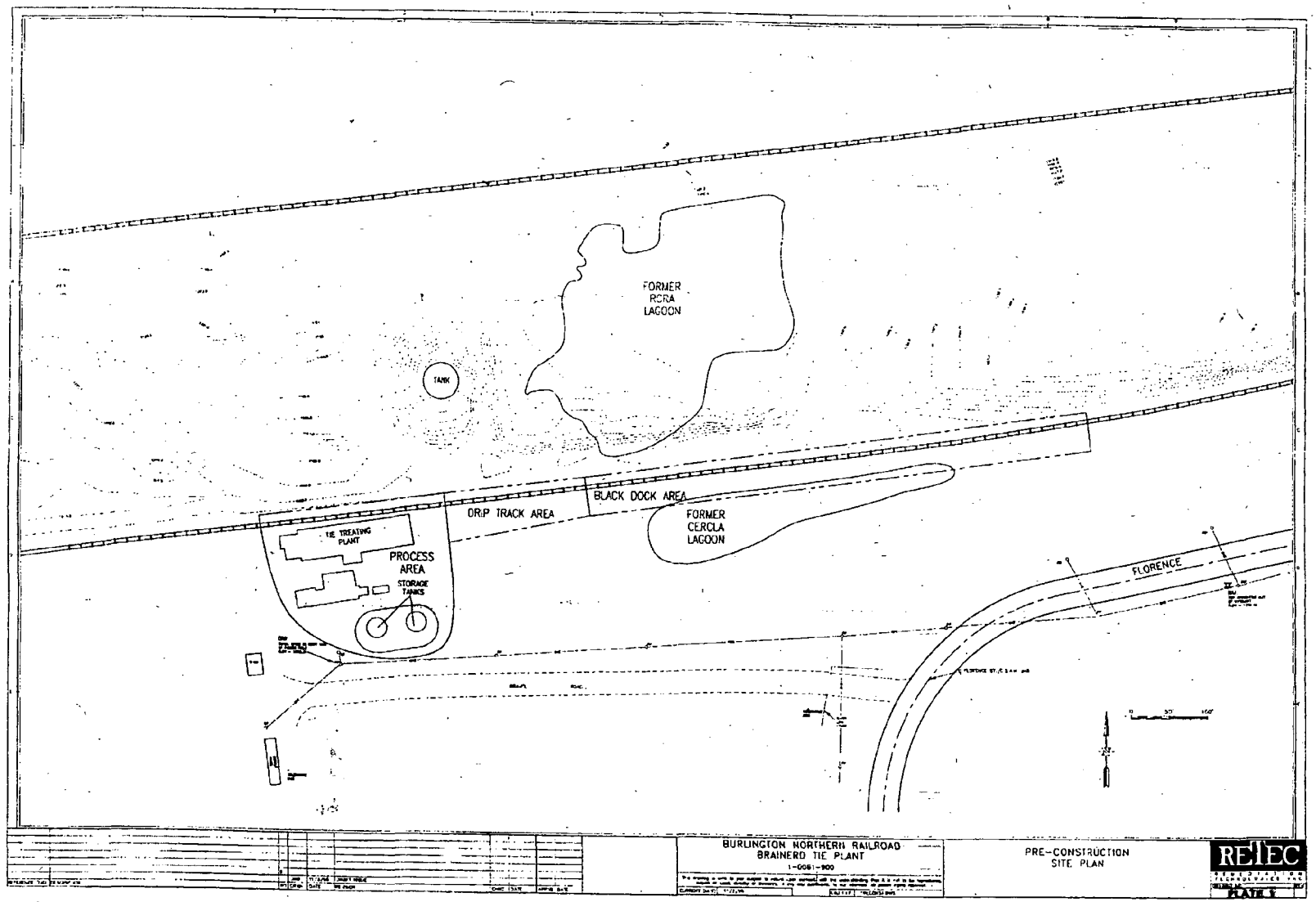
Attachment 1 - Site Map
Attachment 2 – Pre-construction Map
Attachment 3 - Well Map
Attachment 4 - Community Survey Results
Attachment 5 - Public Notice Announcement
Attachment 6 - List of Documents Reviewed
Attachment 7 - Site Photos

Appendices

Appendix A - Changes in Chemical-Specific Standards
Appendix B - A Comparison of new TBCs and Maximum Nonvisible Soil Concentrations for the RCRA Pond for Soils above the Water-Table
Appendix C - A Comparison of new TBCs and CERCLA Lagoon Nonvisible Soil Contamination or Soil Contamination Remaining Below the Water Table
Appendix D - New TBCs and Process, Drip Track, Conveyance Trench, and Black Dock Pre-Excavation Soil Maximum Concentrations

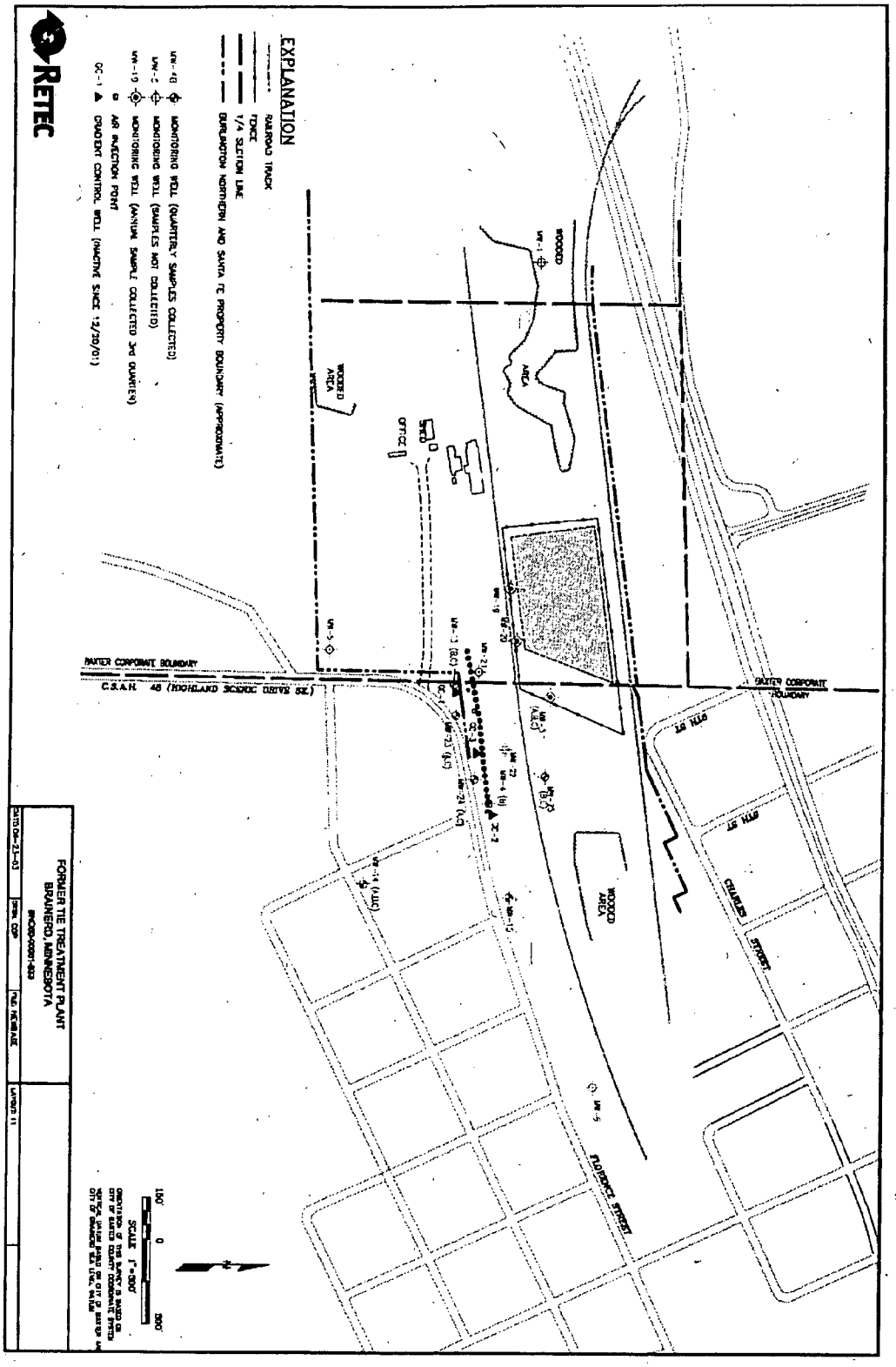
Attachment 1: Site Map





Attachment 2: Pre-construction Site Map

Attachment 3: Well Map



Attachment 4: Public Notice Announcement

NEWS RELEASE

Minnesota Pollution Control Agency

www.pca.state.mn.us

Toll-free and TDD 1 (800) 657-3864

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PUBLIC INPUT SOUGHT FOR BRAINERD/BAXTER AREA BURLINGTON NORTHERN RAILROAD TIE PLANT CLEANUP EFFECTIVENESS

FOR RELEASE: January 10, 2003

Media Contact: Stephen Mikkelson (218) 855-5001
Technical Contact: Susan Johnson (218) 725-7762
Toll Free and TTY: 1-800-657-3864

Brainerd, Minn. -- The Minnesota Pollution Control Agency (MPCA) is starting its five-year review of the Brainerd/Baxter, Minn., Burlington Northern Railroad Tie Plant Superfund site cleanup. Community input in this review is particularly helpful in two areas - observations of the site over time, and ways the cleanup may have helped the area. This review will be completed by spring 2003.

The review process includes site inspections, monitoring and investigation data review, local community-member interviews, and public comment collection. It also summarizes site information, cleanup techniques, and possible future actions.

Superfund law requires sites such as the Burlington Northern Tie Plant that are cleaned up but have allowable levels of contamination remaining to be reviewed at least every five years. The review is to make sure the implemented cleanup remedies were effective and protected human health and the environment.

The site is located partially in the city of Baxter and partially in the city of Brainerd. State Highways 371 and 48 adjoin the north and south property boundaries, respectively. Burlington Northern operated a railroad tie treating plant on the site between 1907 and 1985. The process consisted of pressure treatment using a heated creosote/coal tar or creosote/fuel oil mixture. The Mississippi River flows about 3,000 feet east of the site.

The primary ground water contaminant sources were the shallow lagoons, which were used to hold process wastewater. Between the opening of the plant and October 1982, wastewater was discharged to one of these lagoons. Contaminated soil and sludges

were consolidated into a permanent on-site storage containment closed hazardous waste landfill.

More detailed information about the site and cleanup remedies are available at the MPCA Brainerd office or by calling Steve Mikkelson at (218) 855-5001.

Public comment is sought throughout the review and can be submitted to:

Susan Johnson
Project Leader
MPCA
525 S. Lake Avenue, Suite 400
Duluth, MN 55802
susan.johnson@pca.state.mn.us

Comments must be received by March 15, 2003.

Attachment 5: Community Survey Results

Survey Questions:

1) Do you feel well informed about the site's activities and progress?

2) Are there any observations such as unusual odors, dead plants, or broken fences you may have noticed in the area?

3) Have you ever witnessed any peculiar activity occurring at the site such as trespassing, vandalism, or dumping of any materials?

4) Are you aware of any community concerns regarding the site's current operation and administration? If so, please give details.

5) Do you have any suggestions pertaining to the future land use at the BN Tie Plant Superfund Site?

6) Do you have access to a web connection or e-mail?

7) Would site information be useful on a web page? If so, what kind of information?

8) Are there any other concerns you may have associated with the site area?

A) Concerned Baxter Resident

1) Not at all. It is not covered in the general media and I have been given conflicting answers to basic questions such as "in which direction is the ground water flowing?"

2) No, although I have only recently moved near to the area. We have, however, had odors and problems with our well water after moving into this neighborhood in November 2002.

3) No. I really need to know exactly where the area is to answer adequately. There are often people and parked trucks on Hwy 48 where we thought the area was.

4) The City of Baxter has recently done a $50,000 hydrology study of the area to determine where to place new city wells. Since the city of Baxter seems to be planning city wells in the area SW of the site, and they have discovered the ground water flowing that direction, I would think they, and anyone living in Baxter, would have great concerns that need addressing. I do overhear conversations by residents in Barrows about their fear of contamination from the site. I plan to have our well tested for creosote. One of the local labs seems unaware of the problem. My entire neighborhood is SW of the site and all have well-water. City water is planned for 2007 or later- and the city wells are planned for the same area.

5) Not until it is determined to be safe.

6) yes

7) Yes, exact location on a map. Also the hydrology reports recently done by the City of Baxter that show underground flow of water. Understandable reports of what has been done to clean-up the site thus far and tests of area wells in all directions from the site.
8) I would like to know how large it is and where it is on a local map. I am greatly concerned that more people have not been contacted about the site and that so many do not have information about it locally.

B) Author of the Brainerd Lakes Area Cyber Newsletter

1) Somewhat, I have heard about the site from two main avenues. The first was the Brainerd Dispatch had a long article a while back which made me first aware the site even existed. As a Park Commissioner for the County, I have also heard about the site working there. We are always looking for ways to improve the area with trails and for other recreational purposes. My main title is an Aquatic Biologist and I have worked as an Environmental Consultant in the past where I became more knowledgeable about the site. Finally, a regional PCA manager who is also a friend has informed me about the site.
2) No.
3) No.
4) People are eager to see it developed no real concerns otherwise. I just think the public would want to be ensured the site is in good condition before any development takes place there. They would want to make sure human health is fully assessed and considered safe before being put to use.
5) As I mentioned before, the County Parks Commission would like to have a recreational trail to be put through the site.
6) yes
7) The current uses of the site would be very beneficial, along with any proposed uses the county or city is planning for development of the site.
8) Not really, for a long time when I first moved here, the BN Tie Site was out of site, out of mind. I just hope after it is considered a safe place to be, it becomes a nice piece of land which is appropriately used.

C) Brainerd City Economic Developer/Planner

1) Somewhat
2) No
3) No, nothing specific
4) No
5) I would suggest readdressing the property to make it easier for mail distribution.
6) Yes
7) Yes, sizes and etc.
8) No.

D) Crow Wing County Administrator

1) Yes.
2) No, I have not noticed anything unusual.
3) No, I drive by the Site almost everyday

4) No, other than getting the Site back to its best condition.
5) No, City of Brainerd just wants to support the city of Baxter on the cleanup.
6) Yes
7) Yes, anything that is easy and accessible on the web is always welcomed. Any general information about the sites current condition and new information would be useful.
8) No.

E) Brainerd City Administrator/Clerk
1) I think so.
2) No.
3) No.
4) None besides getting a road built across the site. Also getting the site delisted.
5) Like I said before, getting the road built.
6) Yes
7) Yes, some general site information, any background and site history information would be found useful.
8) No.

F) Baxter Trails Snowmobile Club
1) No, not really.
2) No, grass is growing there just like any other place. It looks fine.
3) No.
4) No, everyone I have talked to considers the place to be safe.
5) A snowmobile trail or the county wants to put a road through the Site for easier flow of traffic in the area.
6) yes
7) Yes, not sure what exactly but it would be a nice resource.
8) No.

G) Concerned Brainerd Resident
1) Medium informed.
2) No
3) No
4) No
5) One item I know that is in the works is a trail which I would be supportive to be put in.
6) yes
7) The only things I might find useful would be what the future plans for the site are going to be.
8) Just a general concern that the site stays monitored and is safe.

H) Baxter City Planner
1) Yes.
2) No.

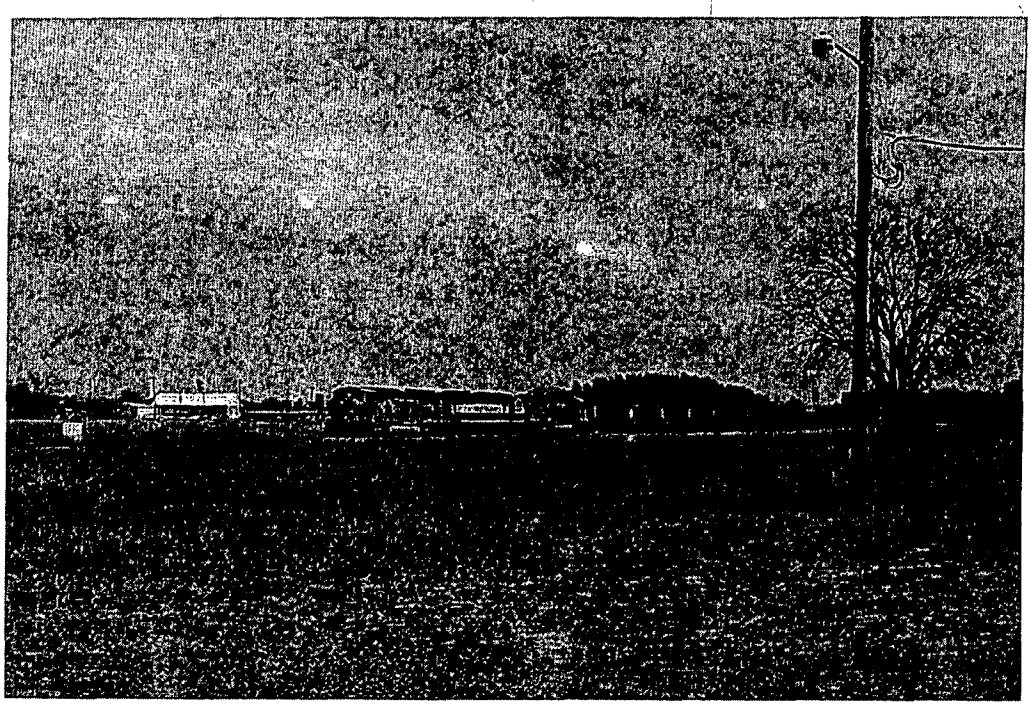
3) No.
4) Yes, the City of Brainerd and Baxter are hoping to work together to get the site back to a use other than just as a Superfund site. I know the County is interested in the development of a road through the site, but I know the two cities are looking for more economic benefits to come out of the site.
5) Looking at it as an industrial park expansion area is a suggestion which may bring in jobs for the site. Mike Brethorst is someone who may know more about this question. Something the County wants, as mentioned before is a roadway built but another idea I know has been brought up was for a trial to go through the current site.
6) yes
7) Something I would find useful would be the status of the site, whether it is on the NPL list or not. Also a web page based on all of the Superfund sites in the area might be of interest.
8) Not anything I am aware of, as far as I know the monitoring has been maintained without any spikes of contamination found. It seems like a safe place.

Attachment 6: Documents Reviewed

Report Title	Date	Prepared By
Hazardous Waste Site Assessment	Jun-83	Environmental Research & Technology, Inc.
Request for Issuance of a Request for Response Action	10-28-83	MPCA
Assessment of Impacts & Mitigation Measures-Appendices	Jan-84	Environmental Research & Technology, Inc.
Assessment of Impacts & Mitigation Measures-Technical Report	Jan-84	Environmental Research & Technology, Inc.
Treatment Completion Report-Creosote Contaminated Soils	Apr-85	Environmental Research & Technology, Inc.
Administrative Order and Response Order by Consent	04-02-85	USEPA
Closure Plan	Sep-85	Environmental Research & Technology, Inc.
Additional Remedial Investigation Report	Nov-85	Environmental Research & Technology, Inc.
Enforcement Decision Document Remedial Alternative Selection	06-04-86	MPCA
Site Investigation Report	Dec-87	Remediation Technologies
Health Assessment	12-08-88	U.S. Public Health Service
Five-Year Review Report	Jan-93	U.S. EPA
Work Plan for Closure of Temporary Stockpile Area	Apr-94	Remediation Technologies
Design Report for Closure of the Land Treatment Unit	May-95	Remediation Technologies
Treatment Completion Report	May-95	Remediation Technologies
Treatment Completion Report	Aug-95	Remediation Technologies
Revised Post-Closure Plan	Sep-95	Remediation Technologies
Construction Completion Report for Closure of Land Treatment Unit – Vol. 1	Oct-95	Remediation Technologies
Five-Year Review Report	03-13-98	US EPA
Brainerd Trail-Hwy 48	08-01-99	Meeting minutes
Permits	Aug-01	MPCA
RCRA O & M Investigation Report	09-20-02	MPCA
GW Monitoring Report, Gradient Control System Shutoff	11-01-02	RETEC Group Inc.
General Correspondence	2002	MPCA
QAPP	May-02	RETEC
2002 Annual Report	Apr-03	RETEC

Attachment 7: Site Photos

Picture 1. Burlington Northern Tie Plant Site: Looking east, closed hazardous waste landfill (RCRA lagoon) on left of tracks, former CERCLA lagoon in foreground right of tracks.



Picture 2. Burlington Northern Tie Plant Site: Looking east, closed hazardous waste landfill on left. Note retail area beyond closed hazardous waste landfill.

Picture 3. Burlington Northern Tie Plant Site: Looking west, air sparging system and gradient control wells. Note paved road on left is proposed to be realigned to proceed straight south across the closed hazardous waste landfill but not will not impact the groundwater remedy system.

Picture 4. Burlington Northern Tie Plant Site: Looking east, closed hazardous waste landfill on left, remaining structure on right. Process area is in foreground and former lagoons are east of structure.

Appendix A: Changes in Chemical-Specific Standards

The 1985 EDD stated that the clean up level for the soils was based on excavating visibly contaminated soil. As stated in the EDD Remedial Alternative Selection, "Visibly contaminated soils are generally characterized by being heavily stained, dark brown to black in color, visibly oily, and usually having a pronounced creosote odor. The visibly contaminated soils are generally characterized by benzene extractable hydrocarbon concentrations ranging from 5 to 30 percent and tot PAH concentrations ranging for 3 to 15 percent."

Soil Standards that have been promulgated since the EDD are outlined below.

	2003 Soil Standard Values			
Contaminant	**Industrial SRV I mg/kg (top four feet)**	**STW SRV mg/kg (top four feet)**	**Tier I SLV mg/kg**	**Tier II SLV mg/kg**
Benzo(a)pyrene Equivalents - • Benzo(a)-anthracene • Benzo(b)-fluoranthene • Benzo(k)-fluoranthene • Benzo(a)pyrene • Indeno(1,2,3-cd)pyrene • Dibenz(a,h)-anthracene • Chrysene	4	10	10.2	To be calculated
Indene	NA	NA	NA	To be calculated
2,3-Dihydroindene	NA	NA	NA	To be calculated
Naphthalene	28	78	7.5	To be calculated
1-Methylnaphthalene	NA	NA	NA	To be calculated

	2003 Soil Standard Values			
Contaminant	**Industrial SRV I mg/kg (top four feet)**	**STW SRV mg/kg (top four feet)**	**Tier I SLV mg/kg**	**Tier II SLV mg/kg**
2-Methylnaphthalene	NA	NA	NA	To be calculated
Biphenyl	NA	NA	6.3	To be calculated
Acenaphthylene	NA	NA	NA	To be calculated
Acenaphthene	5260	19000	50	To be calculated
Fluorene	4120	17240	47	To be calculated
Phenanthrene	NA	NA	NA	To be calculated
Anthracene	454000	100000	942	To be calculated
Fluoranthene	6800	48600	295	To be calculated
Pyrene	5800	43000	272	To be calculated
Benzo(h)fluoranthene	NA	NA	NA	To be calculated
Carbazole	1310	3300	NA	To be calculated
2,3-Dibenzofuran	810	NA	NA	To be calculated
Benzo(b)thiophene	NA	NA	NA	To be calculated
Dibenzothiophene	NA	NA	NA	To be calculated
Indole	NA	NA	NA	To be calculated
Benzo(g,h,i)perylene	NA	NA	NA	To be calculated
Phenol	26800	15070	7.8	To be calculated
2,4-Dimethylphenol	1925	8200	0.34	To be calculated
2,4-Dinitrophenol	NA	NA	0.014	To be calculated
2-Methylphenol (o-Cresol)	352	NA	0.064	To be calculated

	2003 Soil Standard Values			
Contaminant	**Industrial SRV I mg/kg (top four feet)**	**STW SRV mg/kg (top four feet)**	**Tier I SLV mg/kg**	**Tier II SLV mg/kg**
3-Methylphenol (m-Cresol)	352	NA	0.080	To be calculated
4-Methylphenol (p-Cresol)	59	59	0.033	To be calculated
2-Nitrophenol	NA	NA	NA	To be calculated
4-Nitrophenol	NA	NA	NA	To be calculated
Silver	1250	950	3.9	NA
Arsenic	25	55	15.1	NA
Barium	12500	12500	842	NA
Cadmium	250		4.4	NA
Chromium, Hexavalent	425	340	18	NA
Chromium, Trivalent	100000	100000	1000000	NA
Mercury	2	0.7	1.6	NA
Lead	700	700	525	NA
Selenium	1250	950	1.5	NA
Beryllium	290	800	1.4	NA
Copper	9000	9000	400	NA
Nickel	3000	3000	88	NA
Tin	100000	82000	2964	NA
Thallium	21	152		NA
Zinc	70000	54000	1500	NA
DRO and GRO	See below			

DRO and GRO standards: No specific standard values however no significant sources can remain.

Appendix B: A Comparison of new TBCs and Visually Noncontaminated Maximum Soil Concentrations for above the Water Table at the RCRA Lagoon

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Benzo(a)anthracene		See cPAHs	598 mg/kg	B-5 (2.5 – 5 feet)	
Chrysene		See cPAHs	667 mg/kg	B-5 (2.5 – 5 feet)	
Benzo(a)pyrene		See cPAHs	225 mg/kg	B-5 (2.5 – 5 feet)	
Benzo(b)-fluoranthene		See cPAHs	299 mg/kg	B-5 (2.5 – 5 feet)	
Benzo(k)-fluoranthene		See cPAHs	196 mg/kg	B-5 (2.5 – 5 feet)	
Dibenz(a,h)-anthracene		See cPAHs	103 mg/kg	C-6 (5 – 10 feet), < 4 mg/kg all others	
Naphthalene	Industrial and STW SRV; Tier 1 SLV, Tier 2 SLV needs to be calculated if above water-table.	28 mg/kg; 7.5 mg/kg	3530 mg/kg 2720 mg/kg	C-6 (5 – 10 feet), B-5 (2.5 – 5 feet)	Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table. Yes for Ind. SRV Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Acenaphthylene		No Number	1380 mg/kg	B-5 (2.5 – 5 feet)	

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Acenaphthene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	5260 mg/kg; 50 mg/kg	9930 mg/kg	B-5 (2.5 – 5 feet)	Yes for Ind. SRV Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Fluorene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	4,120 mg/kg; 47 mg/kg	9970 mg/kg 1350 mg/kg	C-6 (5 - 10 feet) B-5 (2.5 – 5 feet)	Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table. No for Ind. SRV. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Phenanthrene		No Number	3410 mg/kg	B-5 (2.5 – 5 feet)	
Anthracene	Industrial and STW SRV; Tier 1 SLV.	45,400 mg/kg; 942 mg/kg	586 mg/kg	B-5 (2.5 – 5 feet)	No for Ind. SRV. No for Tier 1 SLV.

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Fluoranthene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	6,800 mg/kg; 295 mg/kg	4100 mg/kg	B-5 (2.5 – 5 feet)	No for Ind. SRV. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Pyrene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	5,800 mg/kg; 272 mg/kg	4490 mg/kg	B-5 (2.5 – 5 feet)	No for Ind. SRV. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Indeno(123-cd)pyrene	Industrial and STW SRV; No SLV	See cPAHs	94 mg/kg	B-5 (2.5 – 5 feet)	
Benzo(ghi)perylene		No number	179 mg/kg	B-5 (2.5 – 5 feet)	
Carcinogenic. PAHs (cPAHs)	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	4 mg/kg BaP Equivalents; 10.2 BaP Equivalents	350.37 mg/kg	B-5 (2.5 – 5 feet)	Yes for Ind. SRV. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Indole		No Standard	Not Analyzed		

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
1-Methyl naphthalene		No Standard	Not Analyzed		
2-Methylnapthalene		No Standard	Not Analyzed		
2,3-Benzofuran	Ind. SRV	810 mg/kg	Not Analyzed		
2,3-Dihydroindene		No Standard	Not Analyzed		
Benzo(b)-thiophene		No Standard	Not Analyzed		
Indene		No Standard	Not Analyzed		
Carbazole	Ind. SRV	1310 mg/kg	Not Analyzed		
Biphenyl	Tier 1 SLV (to water table); Tier 2 SLV to be calculated based on site specific information.	6.3 mg/kg	Not Analyzed		
Phenol, total	STW. SRV Tier 1 SLV (to water table); Tier 2 SLV to be calculated.	15,070 mg/kg 7.8 mg/kg	25 mg/kg	B-5 (2.5 – 5 feet) and C-6 (5 – 10 feet)	No STW SRV at B-5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Phenolics			Not Analyzed		
2,4-Dimethylphenol	Ind. SRV	0.34 mg/kg			
	Tier 1 SLVs (to water table); Tier 2 SLVs to be calculated based on site-specific information.	0.014 mg/kg			
2,4-Dinitrophenol	Tier 1 SLV; Tier 2 SLV to be calculated.	352 mg/kg 0.064 mg/kg			
2-Methylphenol	Ind. SRV;	352 mg/kg			
	Tier 1 SLV; Tier 2 SLV to be calculated.	0.080 mg/kg			
3-Methylphenol	Ind. SRV.	59 mg/kg			
	Tier 1 SLV; Tier 2 SLV to be calculated	0.033 mg/kg			
4-Methylphenol	Ind. SRV.				
2-Nitrophenol	Tier 1 SLV; Tier 2 SLV to be calculated.				
4-Nitrophenol		No Standard No Standard			
Silver	Industrial and STW SRV; Tier 1 SLV	1250 mg/kg; 3.9 mg/kg	<2.5 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for both Ind. SRV and Tier 1 SLV
Arsenic	Industrial and STW SRV; Tier 1 SLV	25 mg/kg; 15.1 mg/kg	<0.25 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Barium	Industrial and STW SRV; Tier 1 SLV	12,500 mg/kg; 842 mg/kg	15 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV
Cadmium	Industrial and STW SRV; Tier 1 SLV	250 mg/kg; 4.4 mg/kg	<1.25 mg/kg	Composited, Soil underlying visibly contaminated.	No for Ind., STW SRVs and Tier 1 SLV
Chromium, Hexavalent	Industrial and STW SRV; Tier 1 SLV	340 mg/kg; 18 mg/kg (hexavalent)	<12.5 mg/kg	Composited, Soil underlying visibly contaminated.	No for Ind., STW SRVs and Tier 1 SLV
Chromium, Trivalent	Industrial and STW SRV, Tier 1 SLV	100,000 mg/kg 1,000,000 mg/kg	<12.5 mg/kg	Composited, Soil underlying visibly contaminated	No for Ind., STW SRVs and Tier 1 SLV
Mercury	Industrial and STW SRV; Tier 1 SLV	0.7 mg/kg; 1.6 mg/kg	<0.2 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV
Lead	Industrial and STW SRV; Tier 1 SLV	700 mg/kg; 525 mg/kg	30 mg/kg	Composited, Soil underlying visibly contaminated.	No for Ind., STW SRVs and Tier 1 SLV
Selenium	Industrial and STW SRV; Tier 1 SLV	1250 mg/kg; 1.5 mg/kg	<0.5 mg/kg	Composited, Soil underlying visibly contaminated.	No for Ind., STW SRVs and Tier 1 SLV.
Beryllium	Industrial and STW SRV; Tier 1 SLV	290 mg/kg; 1.4 mg/kg	<1.25 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV.

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed the New TBC Soil Cleanup Number Max. Conc.?
Copper	Industrial and STW SRV; Tier 1 SLV	9000 mg/kg; 400 mg/kg	45 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV
Sodium		No Cleanup #	1800 mg/kg	Composited, Soil underlying visibly contaminated soil.	
Nickel	Industrial and STW SRV; Tier 1 SLV	3000 mg/kg; 88 mg/kg	57.5 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV
Tin	Industrial and STW SRV; Tier 1 SLV	82,000 mg/kg; 2964 mg/kg	<0.75 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV.
Thallium	Industrial and STW SRV;	21 mg/kg; No SLV	35 mg/kg	Composited, Soil underlying visibly contaminated soil.	Yes, for Ind. SRV if collected in top four feet and not excavated.
Zinc	Industrial and STW SRV; Tier 1 SLV	54,000 mg/kg; 1500 mg/kg	42.5 mg/kg	Composited, Soil underlying visibly contaminated soil.	No for Ind., STW SRVs and Tier 1 SLV.
DRO/GRO		No specific soil criterion but can not have significant sources remaining.	Not Analyzed		

(1) Used lower of industrial or STW SRVs.

(2) Industrial SRVs must be cleaned up to in the top four feet from the ground surface.

(3) Tier 1 and 2 SLVs are screening and cleanup leaching numbers to the water-table, respectively.

(4) Source is Table 3-4, Page 3-7, ERT, November 1985.
(5) Source is Table 2-3, Page 2-8, ERT, June 2, 1983 Report

Appendix C: A Comparison of new TBCs and CERCLA Lagoon Visually Noncontaminated Maximum Soil Concentrations

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed New TBC Soil Cleanup Number Max. Conc.?
Naphthalene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	28 mg/kg; 7.5 mg/kg	6,020 mg/kg	F-3 (7 – 9 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Acenaphthylene		No Number	5;570 mg/kg	F-7 (4.5 – 6.5 feet)	
Acenaphthene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	5260 mg/kg; 50 mg/kg	29, 200 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Fluorene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	4,120 mg/kg; 47 mg/kg	3,310 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Phenanthrene		No Number	7,140 mg/kg	F-7 (4.5 – 6.5 feet)	

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed New TBC Soil Cleanup Number Max. Conc.?
Anthracene	Industrial and STW SRV; Tier 1 SLV.	45,400 mg/kg; 942 mg/kg	1,520 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Fluoranthene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above the water-table.	6,800 mg/kg; 295 mg/kg	9,640 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Pyrene	Industrial and STW SRV; Tier 1 SLV; Tier 2 SLV needs to be calculated if above the water-table.	5,800 mg/kg; 272 mg/kg	10,600 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Benzo(ghi)-perylene		No Number	326 mg/kg		
Benz(a)-anthracene		See cPAHs	1,520 mg/kg		
Chrysene		See cPAHs	1,690 mg/kg		
Benzo(b)-fluoranthene		See cPAHs	757 mg/kg		

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed New TBC Soil Cleanup Number Max. Conc.?
Benzo(k)-fluoranthene		See cPAHs	480 mg/kg		
Benzo(a)pyrene		See cPAHs	575 mg/kg		
Dibenz(a,h)-anthracene		See cPAHs	116 mg/kg		
Indeno(1,2,3-cd)pyrene		See cPAHs	186 mg/kg		
Carcinogenic PAHs	Industrial and STW SRV; Tier 1 SLV. A Tier 2 SLV needs to be calculated.	4 mg/kg; 10.2 mg/kg	928 mg/kg	F-7 (4.5 – 6.5 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Total Phenols	Industrial and STW SRV; Tier 1 SLV. A Tier 2 SLV needs to be calculated if above the water-table.	26,800 mg/kg; 7.8 mg/kg	11 mg/kg	F-3 (7 – 9 feet)	Unknown. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Benzene Extractables		Not Used for Analysis anymore	88,400 mg/kg	F-7 (4.5 – 6.5 feet)	
Indole		None	Not Analyzed		
1-Methylnaphthalene		None	Not Analyzed		

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed New TBC Soil Cleanup Number Max. Conc.?
2-Methylnaphthalene		None	Not Analyzed		
2,3-Benzofuran			Not Analyzed		
2,3-Dihydroindene		None	Not Analyzed		
Benzo(b)-thiophene		None	Not Analyzed		
Carbazole	Ind. SRV	1310 mg/kg	Not Analyzed		
Di-benzothiophene		None	Not Analyzed		
Indene		None	Not Analyzed		
Biphenyl	Tier 1 SLV.	6.3 mg/kg	Not Analyzed		
Phenolics 2,4-Dimethylphenol 2,4-Dinitrophenol 2-Methylphenol (o-Cresol) 3-Methylphenol (m-Cresol) 4-Methylphenol (p-Cresol)	Industrial and STW SRV;Tier 1 SLV Tier 1 SLV Industrial and STW SRV and Tier 1 SLV Industrial and STW SRV and Tier 1 SLV Industrial and STW SRV and Tier 1 SLV	1,925 mg/kg; 0.34 mg/kg 0.014 mg/kg 352 mg/kg; 0.064 mg/kg 352 mg/kg 0.080 mg/kg 59 mg/kg; 0.033 mg/kg 0.060 mg/kg	Not Analyzed		Unknown

Contaminant	Basis for New Cleanup Number (2) (3)	New TBC Cleanup Number (1)	Max. Conc. Visually Non-contaminated Soil (4)	Soil Boring and Depth	Exceed New TBC Soil Cleanup Number Max. Conc.?
2-Nitrophenol 4-Nitrophenol	Tier 1 SLV	None None			
Metals	Industrial and STW SRVs and Tier 1 SLVs – Tier 2 SLVs would need to be calculated if above the water-table.	Various	Not Analyzed		Unknown
DRO/GRO		None for soil but no significant sources should remain.	Not Analyzed		

(1) Used lower of industrial or STW SRVs.

(2) Industrial SRVs must be cleaned up to in the top four feet from the ground surface.

(3) Tier 1 and 2 SLVs are screening and cleanup leaching numbers to the water-table, respectively.

(4) (Page 3-12, ERT, November 1985) (These samples were collected below four feet.).

(5) No shallow soil sample results from 0 to 4 feet are available, so it is unknown if the Industrial SRV was exceeded.

Appendix D: New TBCs, Conveyance Trench Soil Maximum Concentrations, and Process, Drip Track, and Black Dock Pre-Excavation Maximum Visually Noncontaminated Soil Concentrations

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Naphthalene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	28 mg/kg; 7.5 mg/kg	4,160 mg/kg	T-2 (10 –12)	Ind. and STW SRVs may be NA. See Footnote 5. Exceeds Tier 1 SLV. Unknown if exceeds Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	<18.0 mg/kg 47 mg/kg	Shallow soil samples. See Note 6. TP-12A (4)	For Shallow Soils: No for Ind. SRV but only have 6 samples. Unknown for Tier 2 SLV. Need to calculate. Reporting limit too high. Check if above water table. For Soils > 4 feet depth: Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate.
Acenaphthylene		No Number	2,240 mg/kg	T-2 (10 –12)		<23 mg/kg	All Samples, See Note 6;	

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Acenaphthene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	5260 mg/kg; 50 mg/kg	3,750 mg/kg	T-2 (10–12)	Ind. and STW SRVs may be NA. See Footnote 5. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	105 mg/kg 1969 mg/kg	TP-2A (0.25) TP-12A (4)	For Shallow Soils <4 feet: No for Ind. and STW SRVs but only have six samples. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate. For Soils >4 feet: Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.
Fluorene	Industrial and STW SRV; Tier 1 SLV. Tier 2 SLV needs to be calculated if above water-table.	4,120 mg/kg; 47 mg/kg	2,130 mg/kg	T-2 (10–12)	Ind. and STW SRVs may be NA. See Footnote 5. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	136 mg/kg 393 mg/kg	TP-2A (0.25) TP-16B (8)	For Shallow Soils <4 feet: No for Ind. and STW SRV but only have 6 samples. Unknown for Tier 2 SLV. Need to calculate. For Soils > 4 feet depth: Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate.
Phenanthrene		No Number	2,720 mg/kg	T-2 (8 – 10)		413 mg/kg 1408 mg/kg	TP-2A (0.25); TP-16B (8)	

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Anthracene	Industrial and STW SRV; Tier 1 SLV	45,400 mg/kg; 942 mg/kg	930 mg/kg	T-2 (10 –12)	Ind. and STW SRVs may be NA. See Footnote 5. No for Tier 1 SLV	54 mg/kg 189 mg/kg	TP-2A (0.25) TP-16B (8)	For Shallow Soils <4 feet depth: No for Ind.and STW SRVs and Tier 1 SLV: Unknown for Tier 2 SLV. Need to calculate. For Soils > 4 feet depth, no for Tier 1 SLV.
Fluoranthene	Industrial and STW SRV; Tier 1 SLV	6,800 mg/kg; 295 mg/kg	10,400 mg/kg	T-2 (10 –12)	Ind. and STW SRVs may be NA. See Footnote 5. Yes for Tier 1 SLV; Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	451 mg/kg 2382 mg/kg	TP-2A (0.25) TP-16B (8)	For Shallow Soils <4 feet depth: No for Ind. and STW SRVs but only have 6 samples. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate. For Soils > 4 feet depth: Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate.

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Pyrene	Industrial and STW SRV; Tier 1 SLV	5,800 mg/kg; 272 mg/kg	8,120 mg/kg	T-2 (10 –12)	Ind. and STW SRVs may be NA. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	369 mg/kg 1750 mg/kg	TP-2A (0.25) TP-12A (4)	For Shallow Soils <4 feet depth: No for Ind. and STW SRVs but only have 6 samples. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate. For Soils > 4 feet depth: Tier 1 SLV exceeded. Unknown for Tier 2 SLV. Need to calculate.
Benzo(ghi)-perylene		No Number	15.20 mg/kg	T-1 Dup. (6–8)		63 mg/kg 39 mg/kg	TP-2A (0.25) TP-10A (4)	
Benz(a)-anthracene		See cPAHs	1800 mg/kg	T-2 (10-12)		203 mg/kg 341 mg/kg	TP-2A (0.25); TP-16B (8)	
Chrysene		See cPAHs	1310 mg/kg	T-2 (10-12)		206 mg/kg 349 mg/kg	TP-2A (0.25) TP-16B (8)	

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Benzo(b)-fluoranthene		See cPAHs	580 mg/kg	T-2 (10–12)		194 mg/kg 190 mg/kg	TP-2A (0.25) TP-16B (8)	
Benzo(k)-fluoranthene		See cPAHs	203 mg/kg	T-2 (10–12)		73 mg/kg 62 mg/kg	TP-2A (0.25) TP-16B (8)	
Benzo(a)pyrene		See cPAHs	540 mg/kg	T-2 (10–12)		156 mg/kg 76 mg/kg	TP-2A (0.25) TP-10A (4)	
Dibenz(a,h)-anthracene		See cPAHs	34.6 mg/kg	T-1 (6–8)		50 mg/kg 64 mg/kg	TP-1A (0 – 1.7) TP-16B (8)	
Indeno(1,2,3-cd)pyrene		See cPAHs	440 mg/kg	T-2 (10–12)		64 mg/kg 31 mg/kg	TP-2A (0.25) TP-10A (4)	

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Carcingogenic PAHs	Industrial and STW SRV; Tier 1 SLV. A Tier 2 SLV needs to be calculated.	4 mg/kg; 10.2 mg/kg	973.3 mg/kg	T-2 (10–12)	Ind. and STW SRVs may be NA. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	80.06 mg/kg 122.5 mg/kg	TP-2A (0.25) TP-16 (8)	For Shallow Soils <4 feet depth: Yes for Ind. and STW SRVs, but only have 6 samples. Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate. For Soils > 4 feet depth: Exceeds Tier 1 SLV. Unknown for Tier 2 SLV. Need to calculate.
Total Phenols	Industrial and STW SRV; Tier 1 SLV	15,070 mg/kg; 7.8 mg/kg	83 mg/kg	T-2 (10–12)	Ind. and STW SRVs may be NA. See Footnote 5. Yes for Tier 1 SLV. Unknown for Tier 2 SLV. Calculate Tier 2 SLV. Check if above water table.	Not Analyzed		Unknown

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Benzene Extractables	Not Used Anymore. DRO and GRO are presently used. See Below.	66.6% (Process Area); 8.18% (Black Dock Area) 6.85% (Drip Track Area)	122,466 mg/kg	T-2 (10–12)		Not Analyzed		Unknown
Oil and Grease		No such standard currently. Use DRO and GRO.				3.18% 3.22%	TP-6B (1.8) B-9A (8 – 9.5)	
Indole		None	Not Analyzed			Not Analyzed		
1-Methyl-naphthalene		None	Not Analyzed			Not Analyzed		

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
2-Methyl-naphthalene		None	Not Analyzed			Not Analyzed		
2,3-Benzofuran		None	Not Analyzed			Not Analyzed		
2,3-Dihydroindene		None	Not Analyzed			Not Analyzed		
Benzo(b)-thiophene		None	Not Analyzed			Not Analyzed		
Carbazole	Ind. SRV	1310 mg/kg	Not Analyzed			Not Analyzed		
Di-benzothiophene		None	Not Analyzed			Not Analyzed		
Indene		None	Not Analyzed			Not Analyzed		
Biphenyl	Tier 1 SLV	6.3 mg/kg	Not Analyzed			Not Analyzed		

Contaminant	Basis for New Cleanup Number (1) (2) (3)	New TBC Cleanup Number	Max. Conc. Of Conveyance Trench Soil Samples (4)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. Conveyance Trench Area?	Max. Conc. Of Visually Noncontaminated Soils in the Process, DripTrack, and Black Dock Areas (5)	Soil Boring and Depth (feet)	Exceed New TBC Cleanup Number by Max. Conc. of Visually Noncontaminated Soils for the Process, Drip Track, and Black Dock Areas? (6)
Metals	Industrial and STW SRVs And Tier 1 SLVs Tier 2 SLVs may need to be calculated if Tier 1 SLV exceeded and samples are above the water-table.	Various	Not Analyzed		.Unknown. Ind. and STW SRVs may be NA. Various Tier 1 SLVs	Not Analyzed		Unknown
DRO/GRO		None developed but can not have significant sources in soils.	Not Analyzed		Unknown	Not Analyzed		Unknown

(1) Used lower of industrial or STW SRVs.

(2) Industrial SRVs must be cleaned up in the top four feet from the ground surface.

(3) Tier 1 and 2 SLVs are screening and cleanup leaching numbers to the water-table, respectively.

(4) Table 3-8, ERT, November 1985. Samples from this trench were collected a minimum of six feet depth as the pipeline was buried. No samples were collected from 0 to 4 feet depth.

(5) Tables 2-1, 3-1, 4-1, and 4-2, Remediation Technologies, Inc., Site Investigation Report, Burlington Northern Tie-Treating Plant, Brainerd, Minnesota, December 1987.

(6) Shallow visually noncontaminated soil samples from the Black Dock Area: TP-1A 0 – 1.7 feet); TP-1B (1.7 feet); TP-2A (0.25 feet); TP-2B (1.7 – 2.5 feet); and TP-6B (1.8 feet).
Shallow visually noncontaminated soil sample from the Drip Track Area: TP-7B (1.3 feet).
Process Area: Only deep visually noncontaminated soil samples were collected. Soils in top four feet either sludge or visually contaminated. Visually noncontaminated samples consist of: TP-10A (4 feet); TP-12A (4 feet); TP-16B (8 feet); B-5A (12 – 13.5 feet); B-1 (9.5 – 11 feet); T-19A (5 – 7 feet); B-4A (9 – 10.5 feet); B-4B (12 – 13.5 feet); B-7B (16.5 – 18 feet); and B-9A (8 – 9.5 feet).